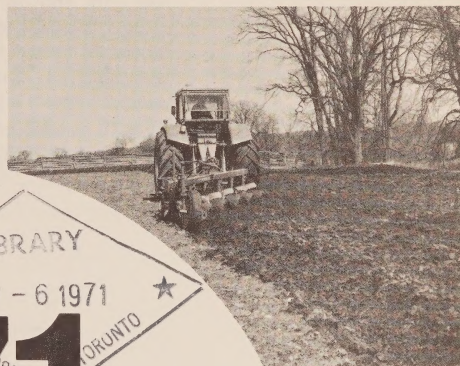
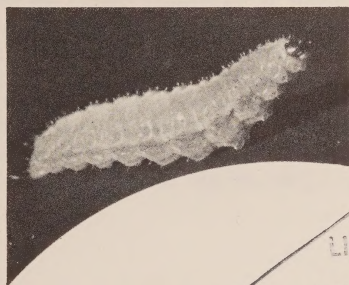
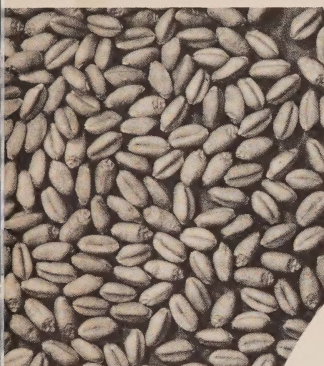


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FIELD CROP RECOMMENDATIONS



ONTARIO
DEPARTMENT OF

AGRICULTURE & FOOD

PARLIAMENT BUILDINGS, TORONTO



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Under regulations of the Pesticides Act, administered by the Ontario Department of Health, **no one may use aldrin, DDD (TDE), dieldrin, and heptachlor** to control insects on crops. DDT may not be used, except by special permit. For further information consult the Soils and Crops Specialist in your area, or Pesticides Control Section, Environmental Health Services Branch, Ontario Department of Health, 1 St. Clair Avenue West, Toronto 195, Ontario (telephone 416-365-2401).



Space limitations in this booklet restrict the amount of detail which can be included in each recommendation. Where commercial products are recommended, this detail is provided, by law, on the container label. Read and follow the directions, conditions, and limitations described on such labels. This is the only way to make effective, safe use of such products (see also Pages 54 and 55). Additional information on other practices recommended here can be obtained from the local office of the Ontario Department of Agriculture and Food. (See Pages 58 and 59.)

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CORN

1971 Recommended Hybrids

Corn hybrids suitable to Ontario conditions are arranged here in order of maturity from short- to long-season types. Company name and number are both needed to identify each hybrid.

The rating on the left indicates the number of heat units required to mature the hybrids. The heat unit requirement for each hybrid can vary slightly (50 to 75 heat units) from year to year and therefore, the order of maturity may change as more information is obtained on each hybrid. The heat unit rating refers to some hybrids above and below as well as opposite the number.

Heat Unit Rating	Hybrid	Heat Unit Rating	Hybrid	Heat Unit Rating	Hybrid
2 6 0	United 106	SC	Co-op 270	DC	Asgrow United
	Warwick SL209	SC	Co-op 277	DC	A. T. C. 39
	DeKalb 007	DC	Pride 137	DC	3W
	United 108	SC	Michigan 275-2X	SC	2
	Stewarts 2301	SC	United 127A	SC	0
	Stewards 2605	SC	DeKalb 45	DC	0
	Pioneer 3972	3W	Seneca 285	3W	Belle River 350
	Pride 116	DC	N. K. PX446	3W	Co-op S327
	N. K. KE 410	DC	N.K. PX20	SC	SC
	P. A. G. SX42	SC	Funk's G 4110	SC	Pioneer 3579
2 7 0 0	United 4	DC	Funk's G 4180	3W	DeKalb XL316
	Warwick 261	DC	Pioneer 3909	SC	OC
	DeKalb XL301	3W	Pride R221	3W	Warwick TX60
	Funk's G4082	3W	Co-op S280	OC	P. A. G. SX76
	Warwick TX21	3W	N.K. PX476	3W	SC
	Stewarts 2704	SC	Renk R98	DC	3W
	Stewarts 2606	SC	Jacques JX902	SC	OC
	Pioneer 3889	DC	Jacques JX952	SC	3W
	Pioneer 3873	DC	Jacques 951 J	DC	SC
	Warwick 214	DC	P.A.G. 34	3W	Warwick SL510
2 8 0 0	P. A. G. SX47	SC	Pride 280	DC	OC
	Pride 110	DC	Seneca XX316	3W	N.K. PX47
	Seneca XX155	3W	Warwick 316	DC	SC
	Stewarts 3710	3W	Warwick 401	DC	3W
	Funk's G43	DC	Warwick SL415	SC	4
	Belle River 889	DC	Warwick 405	DC	0
	United 111	SC	Pioneer 3911	SC	0
	Funk's G5145	DC	Pioneer 3814	DC	Jacques JX1052
	Funk's G5150	DC	Pioneer 3675	DC	SC
	DeKalb XL11	SC	Acco UC1900	SC	3W
2 8 0 0	Pride 119	DC	DeKalb XL15A	SC	SC
	Pride R129	3W	Seneca XR22	SC	3W
	Warwick 292	DC	Warwick SL416	SC	SC
	DeKalb XL304	3W	Pioneer 385	DC	SC
	Stewarts 4711	DC	Seneca 318	3W	DeKalb XL45A
	United 7	DC	Belle River 251	SC	SC
	Pioneer 3959	3W	DeKalb XL24	SC	P.A.G. SX69
	Pioneer 3853	DC	Belle River 295	SC	SC
	N. K. PX442	3W	Jacques 1004E	DC	United 1XL5
	P. A. G. SX48	SC	Pioneer 3773	SC	SC
2 8 0 0	P. A. G. 25	DC	Pride R381	3W	SC
	P.A.G. 22	DC	Co-op 297	DC	SC
	Jacques JX22	SC	Funk's G4252	3W	Warwick TX71
	Pioneer 3956	SC	United 128	SC	3W
					Tomco UC 4400
					SC
					United IXL6
					SC

DC—Double Cross
SC—Single Cross

3W—Three-Way Cross

OC—Other Crosses (Modified Single, Modified 3-Way)

NOTE — Refer to Page 10 for more information about
LEAF BLIGHTS before selecting hybrids.

Choosing Hybrids For Your Farm By Heat Units

Locate the vicinity of your farm on the map on Page 6 and estimate the heat unit rating for your farm. If you plant corn BEFORE mid-May, choose a hybrid from among those on the recommended list having equal or LOWER rating than your farm.

If soil conditions or any other factor on your farm usually DELAYS planting later than mid-May, then for a DELAY of one week or more, DEDUCT 100 heat units for EACH week from the rating for your farm and select hybrids from the list having that rating, or a LOWER rating.

Seeding Date and Planting Depth

Optimum seeding date centers on May 7 in southwestern Ontario, and May 10 in central and eastern Ontario. Those seeding earlier commonly must contend with lower soil and air temperatures. Studies show there is a relationship between emergence, temperature, and depth of seeding. The early seeding should be sown shallow (1½ to 2 inches at

a maximum). If they are sown deeper a delay and reduction in emergence can occur. The result is an uneven stand. For later seedings (temperature is warmer) there may be a slight slowing of emergence for deeper plantings but the reduction in stand likely will be small.

Plant Populations

In standard row widths of 36, 38, and 40 inches, a population of 18,000 plants per acre is recommended. It probably should be reduced somewhat in areas of frequent drought, where fertility is low, or under late-planting conditions. A higher population is probably warranted where maximum yield is being sought, assuming moisture is adequate, fertility is high, and planting is early.

Inches Between Seeds to Achieve Specified Populations

EXPECTED PLANTS PER ACRE	REQUIRED SEED PER ACRE (ASSUME 85% STAND)	ROW WIDTH					
		28	30	32	36	38	40
18,000	21,200	10.5	9.8	9.1	8.2	7.8	7.4
20,000	23,500	9.5	8.9	8.2	7.4	7.0	6.7
22,000	25,900	8.6	8.1	7.6	6.7	6.4	6.1
24,000	27,600	8.1	7.6	7.1	6.3	5.9	5.6

Fertilizers for Corn

Fertilizer needs of the corn crop should be determined from a soil test. The following general fertilizer recommendations should be followed only when a soil test report is not available.

■ On sandy or loamy soils use 100 lb N, 60 lb P₂O₅ and 60 lb K₂O per acre, e.g. 6-24-24 (a 1-4-4 ratio), at 250 lb per acre, plus 85 lb additional N.

■ On clay soils use 100 lb N, 60 lb P₂O₅ and 30 lb K₂O per acre, e.g. 8-32-16 (a 1-4-2 ratio) at 200 lb per acre, plus 85 lb additional N.

■ If well-manured, reduce the total fertilizer application by one-quarter. Following a legume sod, only the nitrogen can be reduced to a total of 50 lb per acre. If manured and following a legume sod, additional N will not be required.

Methods of Fertilizer Application

The nitrogen should be applied in the spring with the major portion either as a preplant application (broadcast on the surface and worked in, plowed down, injected) or side dressed before the corn is 12 inches high. Fall application of nitrogen is not as effective as application in the spring; therefore, only spring application is recommended.

The major portion of the phosphorus and potassium may be broadcast and worked into the soil either in the fall or spring. If applied in the spring, the nitrogen, phosphorus, and potassium may be applied in one operation by using a mixed fertilizer.

However, a fertilizer containing nitrogen and phosphorus or nitrogen, phosphorus, and potassium should be applied as a starter at planting time. This can be done in one of two ways:

(A) Apply the starter fertilizer as a band 2 inches to the side and 2 inches below the seed. The rate of application should not exceed 50 lb of nitrogen or 80 lb of nitrogen and potash per acre in 38-inch rows. Not more than 25 lb of urea nitrogen should be applied in this position.

To Calculate Nitrogen and Potash Content: Examples

250 lb of 6-24-24 per acre provides 75 lb of nitrogen and potash

200 lb of 8-32-16 provides 48 lb of nitrogen and potash

OR

(B) Apply the starter fertilizer in the row with the seed. The rate of fertilizer with the seed should not exceed 6 lb of nitrogen and potash in 38-inch rows. Neither urea nor diammonium phosphate (18-46-0) should be applied in contact with the seed of corn.

To Calculate Nitrogen and Potash Content: Examples

40 lb of 5-20-10 per acre provides 6 lb of nitrogen and potash

50 lb of 8-25-3 per acre provides 5½ lb of nitrogen and potash

NOTE: Regardless of whether method A or B is used, the rate of applying the starter fertilizer can be increased if the rows are narrowed, provided that the concentration in the row does not exceed that specified for 38-inch rows.

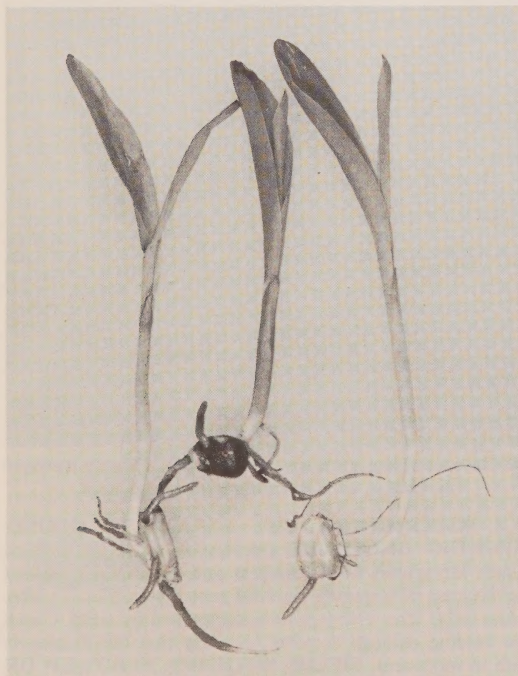
Disease And Insect Control In Corn

(See also Pages 54 to 55)

SEED TREATMENT — Commercial corn seed sold in Ontario has been treated with a fungicide, such as thiram or captan, for protection against **SEED DECAY** organisms. Some seed has been treated also to control stored-seed insects. All seed should be treated further by the grower. Use the planter- or drill-box method. Use diazinon to reduce damage by **SEED MAGGOTS** and lindane for protection from **WIREWORMS**. Seed treat-

ment combinations of diazinon and lindane should be used every year and these are available from seed suppliers in individual containers for 1 bu lots of seed. Follow the directions on the label with care.

Wear rubber gloves and use a wooden paddle for mixing the chemicals with the seed. Do not inhale dust stirred up during mixing. Thorough mixing is important.



Wireworms attack untreated seed.

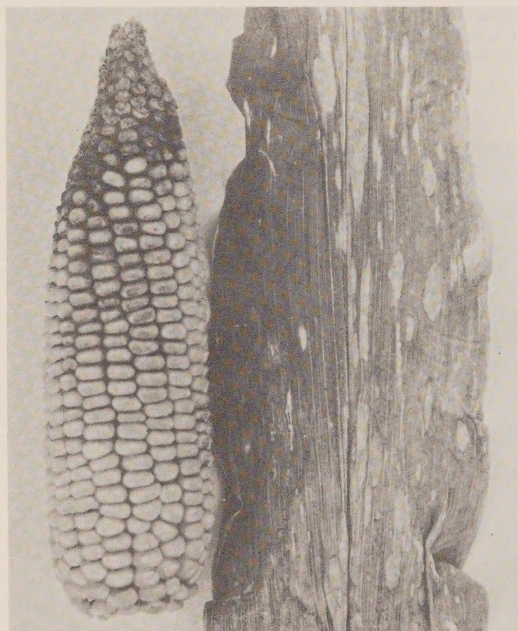


Corn field heavily damaged by wireworm.

DISEASES

SOUTHERN LEAF BLIGHT and YELLOW LEAF BLIGHT. Damage can be reduced by:

1. Plowing under old cornstalks and leaves to help kill overwintering disease-fungi.
2. Rotating corn with other crops to help prevent disease buildup.
3. Minimizing plant stresses by
 - (a) keeping plant populations below 22,000 per acre, and
 - (b) maintaining high soil fertility and good soil structure. Avoid poorly-drained land.
4. Planting hybrids or blends of resistant with susceptible hybrids. Hybrids from seed produced on detasseled plants having "normal" makeup (or "N" cytoplasm) are resistant to the blights. Hybrids from seed produced on Texas male-sterile plants (with "T" cytoplasm) are susceptible to the blights. Seed corn for sale for the 1971 season will be tagged N (normal), T (Texas male-sterile), or B (blend of N with T). Although it is not possible to predict how severe leaf blight will be in 1971, the disease is not expected to become serious in Ontario.



Southern leaf blight on leaves and grain

STALK ROT. Harvest as early as possible because stalk rot develops mostly on mature plants and becomes a greater problem the longer the crop is left in the field. Stalk rot is often serious in fields with high plant populations, low fertility, and poor soil conditions. Grow hybrids with low stalk breakage counts, as listed in the 1971 Ontario Hybrid Corn Performance Trials. Copies are available from your county Agricultural Representative.

INSECTS

CORN ROOTWORM. Where corn is grown continuously, this insect tends to increase in numbers. The present distribution and relative abundance are shown below. Within each region delineated on the map there may be pockets where the infestations are greater than in the region as a whole.

Before considering a control measure, corn growers should establish the levels of rootworm infestation in EACH field by

1. DETERMINING LARVAL (worm) PRESENCE.

About the second week of July when larval size and population are usually optimum, dig 10 or more plants at random from all parts of the field. Place each plant on a 3-foot-square piece of black plastic. Shake all soil from the roots and break up the clods. Roll the soil slowly by lifting one side of the sheet and watch for the worms at the top edge of the soil; or use a stick to work small quantities of soil from one portion of the sheet to the other. Also split thick roots to check for worms and feeding. Make a worm count. **AN AVERAGE OF 10 OR MORE ROOTWORMS PER PLANT IS CONSIDERED TO BE A DAMAGING INFESTATION WARRANTING A CONTROL MEASURE THE FOLLOWING YEAR.**



Normal root system (left) and a root system severely damaged by feeding of northern corn rootworm larva.

2. DETERMINING THE EXTENT OF GOOSE-NECKING AND ROOT DAMAGE. Heavily infested plants are usually bowed or bent and can easily be pulled up because of a greatly reduced root system. Such plants often lodge after heavy rains accompanied by wind. Check for feeding damage to roots to verify that the lodging is due to rootworm. **FIELDS WITH 10% ELBOWED OR GOOSE-NECKED PLANTS INDICATE A NEED FOR CONTROL.**



Goose-necked plants with reduced root systems are an indication of a high rootworm population.

The corn rootworm feeds only on corn. **CROP ROTATION IS THE EASIEST AND MOST HIGHLY RECOMMENDED METHOD OF CONTROL.**

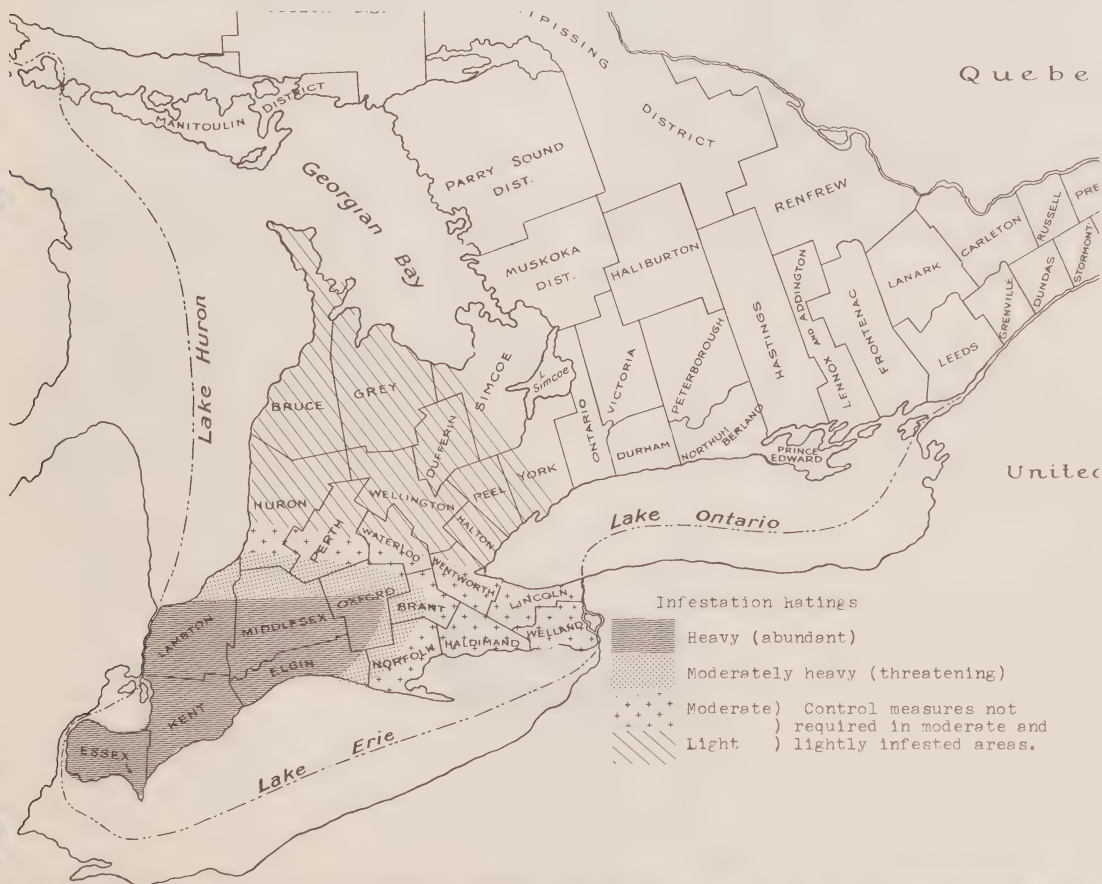
otherwise

Use any one of the following treatments (granular formations) in a 3- to 6-inch band, placed $\frac{1}{2}$ to 1 inch above the seed and in front of the press wheel, but not in contact with the seed. **DO NOT USE AS A BROADCAST APPLICATION. USE THE LOWER RATES ON LIGHTER SOIL.**

1. Bux 10% granular	7½ to 10 lb
2.*Dyfonate 10% granular	7½ to 10 lb
3.*disulfoton (Di-Syston) 15% granular	4 to 7 lb
4. chlordane 25% granular	4 to 8 lb
5.*phorate (Thimet) 10% granular	5 to 10 lb

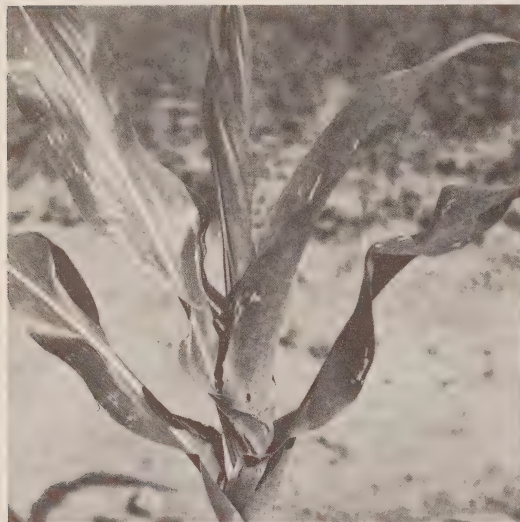
Pollination sometimes is reduced by rootworm adults feeding on silks but control is not usually practical.

*These materials are deadly poisonous to the operator. Handle with care. Follow all safety directions stated on the label.



1970 distribution of the northern corn rootworm. Rootworm has not been found east of York County as indicated above.

EUROPEAN CORN BORER. There is some evidence that the European corn borer is increasing in importance as a pest of field corn. This is especially true where corn follows corn. There was a rather heavy infestation in 1970 but the amount of actual crop loss due to stalk breakage is hard to estimate since it varies greatly in different hybrids. Growers must be alert to possible economic loss from the pest.



Serious leaf feedings by corn borer. Treat plants **BEFORE** tassels show if 75% of the plants show damage.

The cream-colored female moth lays her eggs usually on the underside of corn leaves, beginning in early June in southwestern Ontario and somewhat later in other parts of the province. After hatching, the young borers feed on the leaves, giving them the appearance of having been pricked repeatedly by a pin. Sometimes the feeding scars are elongate. Later, the borers work downward into

the "throat" (whorl) of the plant and feed on the developing leaves. Afterwards, they enter the stalk. Control is effective only if the borers are destroyed before they enter the stalk.

You should examine the plants for borer feeding before tassels show in the whorl or when plants are about 2 feet high. If you find that more than 75% of the plants show feeding scars and if you are growing a hybrid that is susceptible to stalk breakage, treat with an insecticide at the per-acre rate given below:

Spray **Carbaryl (Sevin) 50% WP 3 lb per acre
or
80 or 85% WP 1¼ lb per acre

***Carbaryl is toxic to bees; do not use near clover fields in bloom, when corn is shedding pollen, or in the general area of apiaries.*

Be sure that the insecticide is applied into the whorl of the plant.

NOTE: Loss in grain corn is seldom high enough to warrant control. Two applications 7 to 10 days apart may be needed for significant control.

CUTWORMS. If climbing species attack the foliage of corn plants, **SPRAY** the seedlings in a 10-inch band in the row with carbaryl (Sevin) 50% wettable, 4 lb; or 80 to 85% wettable, 2½ lb.

ARMYWORM. Because grassy and weedy corn is attractive to armyworm moths for egg-laying, eliminate grasses and weeds from the corn crop. (See Ontario Department of Agriculture and Food Publication 75, **Guide to Chemical Weed Control**.) The result will be less armyworm damage to corn.

If armyworms move into corn fields, spray the border rows and adjacent cereals, pasture, or hay crops with carbaryl (Sevin), malathion or methoxychlor.

Read the warning about bees on Page 54 before spraying an in-bloom forage crop.

CEREAL LEAF BEETLE. Refer to section on "Grain Crops", Page 39, concerning movement of shelled and ear corn.



CHEMICAL WEED CONTROL IN CORN

Always read and follow the instructions which the manufacturer has printed on the herbicide label. This will give you further information on how to apply the chemical and on conditions which will affect results. This can save you money and help prevent crop damage.

Corn	Weed Situation	Chemical	Rate per Acre Active Ingredient	Remarks
Preplant-incorporated	Germinating weeds, annual grasses, including crabgrass, old witch grass, nut sedge, horse-tail.	Butylate (Sutan) + Atrazine	2 to 4 lb + 1 lb	<p>BUTYLATE (SUTAN) is a related chemical to EPTC (EPTAM) and is safer to use than EPTC on corn or light soils. This treatment is applied to a dry soil surface and incorporated within 10 minutes as specified for EPTC (EPTAM).</p> <p>No delay in seeding is required when using SUTAN. EPTC (EPTAM) has shown a considerable degree of safety on corn except on coarse, sandy soils. This treatment should be applied to a dry soil surface before planting and incorporated within 10 minutes with a double disk. A second incorporation at right angles with the disk in tandem with a harrow should be done as soon as possible. The 2-lb rate is used for annual grass control without delay in seeding. The 3-lb rate is needed for nut sedge control. A 7- to 10-day delay in seeding is suggested when using 3 lb (see label).</p> <p>To obtain a much better overall weed control, 1 lb of ATRAZINE should be applied with EPTAM or SUTAN either as a tank mix or as a pre- or post-emergence spray.</p>
		EPTC (EPTAM) + Atrazine	2 to 3 lb + 1 lb	
Preemergence	Germinating weeds	Atrazine	1½ to 2 lb	<p>The standard preemergence method of applying ATRAZINE is an effective treatment. This treatment level will not eradicate quack grass and is most likely to miss annual grasses, in particular crabgrass.</p> <p>ATRAZINE plus ALACHLOR (LASSO) is a combination to which LASSO is specifically added because of excellent control of annual grasses for an 8- to 12-week period. Such a treatment should be considered where a buildup of annual grasses is evident.</p> <p>Sold only as LONDAX, a commercial granular or wettable powder formulation. Provides both annual grass and seedling broadleaf weed control. RAMROD is generally a short-duration annual grass control. This treatment finds its most important use in band applications with subsequent row cultivation. RAMROD has given good results on muck and high organic matter soils.</p>
		Atrazine + Alachlor (Lasso)	1 lb + 1 lb	
		Linuron + Propachlor (Ramrod)	1 to 1½ lb + 2 to 3 lb	

Corn	Weed Situation	Chemical	Rate per Acre Active Ingredient	Remarks
Preemergence	Germinating weeds	Bladex	2-3 lb	BLADEX controls most annual grasses and broad-leafed weeds with a good margin of safety. Barnyard grass and redroot pigweed are not adequately controlled. Quack grass is not controlled. Not recommended for heavy clay or muck soils. The low rates of 2 lb/acre should be used on coarse-textured soils. The addition of ATRAZINE will improve control of redroot pigweed and barnyard grass in particular.
		Bladex + Atrazine	2 lb + 1 lb	
Postemergence	Seedling weeds; broad-leaf weeds 2 to 4 inches; grasses at emergence	Atrazine	1½ to 2 lb	If ATRAZINE is applied before annual grasses reach the 3-leaf stage it provides a generally good to excellent weed control.
	Seedling weeds; broad-leaf weeds 2 to 4 inches; annual grasses 1- to 3-leaf stage	Atrazine + Oil	1 to 2 lb + 1.5 gal	The oil is a light mineral oil containing a suitable emulsifier. The oil is added to the spray tanks during filling at the rate of 1½ gal per acre. Add ATRAZINE to the water before adding the oil. Agitate the mixture while filling the tank.
		Atrazine + Simazine + Oil	1 lb + 1 lb + 1.5 gal	Do not use 2,4-D, 2,4-DB, MCPA or DICAMBA in conjunction with the oil-water emulsion method of applying ATRAZINE. Annual grasses (foxtails, crabgrass, old witch grass, etc) should be sprayed before they reach the 3-leaf stage. This time of spraying should be based on stage of annual grass growth. Instances of early injury on corn have been reported following ATRAZINE in oil-water applications, especially during cold weather, but it may also occur under other conditions of stress such as hot, dry weather. The corn invariably has recovered.
	Many broadleaf annuals and perennials (control)	2,4-D (Amine)	8 oz	Generally speaking the selective hormone chemicals have been replaced in corn production with selective residual weed killers. There still remain, however, a few weeds where 2,4-D, 2,4-DB, MCPB, DICAMBA and some mixtures are needed for control of such weeds as thistles and field bindweed.
	Annuals and Canada thistle	MCPB and MCPA mixture (15:1)	16 to 24 oz	
	Annuals and Canada thistle	2,4-DB (Ester)	16 to 20 oz	

Annuals and sow thistle,
Canada thistle, field
bindweed, wild buck-
wheat, smartweed

2,4-D (Amine)
or
DICAMBA
or
Mixtures of:
2,4-D (Amine)
MCPB
DICAMBA

8 oz of
total acid

Directed Postemergence	Emerged weed vegeta- tion including nut sedge (up to 6 inches in height)	Linuron + Oil	1 to 2 lb + 1 qt	Applied as a directed spray after the corn is 12 inches or more in height. Careful application with rigid drop pipes or other special equipment which places the spray under the corn leaves but on the weeds is recommended. Full instructions are on the label; follow these carefully. Used for control of weeds which have escaped a previous treatment.
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Special Problems	Quack grass, and ger- minating weeds	Amitrole T (preplant) + Atrazine (pre- or early postemergence)	2 lb + 2 lb	Apply AMITROLE T to quack grass foliage early in the spring, plow or cultivate one week later, and plant to corn. Follow up by an application of ATRAZINE pre- or postemergence. Row cultivation will add to the effectiveness of this treatment. Use where ATRAZINE residues may be a problem the following year.
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	Atrazine (preplant) + Atrazine (pre- or early postemergence)	2 lb + 2 lb	Apply the first application of ATRAZINE (2 lb/acre) on emerged quack grass in the fall or early spring, plow or work 1 to 4 weeks later. After planting the corn make a second application of ATRAZINE (2 lb/acre) as recommended for preemergence or early postemergence control. Use where corn follows corn and ATRAZINE residues are not a problem.
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Emergency quack grass control	Atrazine + Oil	3 to 4 lb + 1½ gal	Apply to heavy, emerged quack grass stands. The emergency quack grass treatment, while often very effective, is seldom as effective in controlling quack grass as the carefully planned and applied split applications of ATRAZINE.
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Nut sedge and germinat- ing weeds	Atrazine (preplant) + Atrazine (early postemergence)	2 lb + 2 lb	ATRAZINE split application using 2 lb (active) per acre applied to the soil in the spring before shoots emerge and worked in to a depth of 2 to 3 inches. Make a second application of 2 lb (active) early post-emergence when the nut sedge is in the spike stage. Cultivation may be necessary to obtain good control.
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CORN HERBICIDE WEED CONTROL RATINGS

This chart is intended to help in the selection of a herbicide to control specific weeds. For complete information refer to remarks given for each chemical on the preceding pages.

The chemical ratings in this chart give general comparisons based on use as described in this publication. In unfavorable conditions (e.g. too dry, too wet, too cold, and poor spray job) the herbicides may not be as effective as shown in the chart.

Weed Control Rating E — excellent G — good F — fair P — poor	ANNUAL BROADLEAVES								ANNUAL GRASSES					PERENNIALS						CORN TOLERANCE		
	buckwheat, wild	corn spurry	lady's-thumb	lamb's-quarters	mustards	nightshade, black	pigweeds	ragweeds	velvetleaf	barnyard grass	crab grass	fall panicum	foxtail	old witch grass	bindweed, field	horsetail	milkweed	nut sedge	quack grass		sow-thistle	thistle, Canada
ACTIVE CHEMICAL PER ACRE																						
SPLIT APPLICATION Amitrole 2 lb + Atrazine 2 lb	E	E	E	E	E	E	E	E	F	G	P	P	G	G	P	P	P	F	G	P	P	E
Atrazine 2 lb + Atrazine 2 lb	E	E	E	E	E	E	E	E	F	E	F	F	E	E	F	F	P	G	E	G	-	E
PREPLANT INCORPORATED Sutan 2-4 lb	P	G	P	F	P	G	F	F	P	E	E	G	E	E	P	F	P	G	P	P	P	E
Sutan 2-4 lb + Atrazine 1 lb	G	G	G	G	G	E	G	G	F	E	E	G	E	E	P	F	P	G	F	F	P	E
Eptam 2-3 lb	P	G	F	G	P	G	F	F	F	E	E	G	E	E	P	P	P	E	P	P	P	G
Eptam 2-3 lb + Atrazine 1 lb	G	G	G	E	E	G	E	E	F	E	E	G	E	E	P	F	P	E	F	P	P	G
PREEMERGENCE Atrazine 1½-2 lb	E	E	E	E	E	E	E	E	F	G	P	P	G	G	P	P	P	P	P	P	P	E
Atrazine 1 lb + Bladex 1½ lb	E	E	E	E	E	E	E	E	F	G	E	P	E	E	P	P	P	P	P	P	P	E
Atrazine 1 lb + Lasso 2 lb	E	E	E	E	E	E	E	E	F	E	E	E	E	E	P	P	P	P	P	F	P	E
Lasso 2 lb	P	P	P	F	P	G	G	P	P	E	E	E	E	E	P	P	P	P	P	P	P	E
Bladex 3 lb	G	-	G	E	E	E	F	E	P	F	E	P	E	E	P	P	P	P	P	P	P	E
Linuron 1½ lb + Ramrod 3 lb	E	-	E	E	E	G	E	E	F	E	E	E	E	E	P	P	P	P	P	P	P	G
POSTEMERGENCE Atrazine 2 lb + 1 gal oil	E	E	E	E	E	E	E	E	F	E	P	P	G	E	F	F	P	F	F	F	P	G
Atrazine 2 lb	E	E	E	E	E	E	E	E	F	G	P	P	F	G	P	P	P	F	F	F	P	E
Atrazine 1 lb + Simazine 1 lb + 1 gal oil	E	E	E	E	E	E	E	E	F	G	G	F	F	G	P	P	P	F	F	F	P	G
2,4-D (Amine) 6-8 oz	F	P	F	E	E	E	E	E	E	P	P	P	P	P	F	P	P	P	P	F	F	F
2,4-DB 16-20 oz	G	P	P	E	G	E	E	E	E	P	P	P	P	P	F	P	P	P	P	G	G	F
2,4-D (Amine), Dicamba Mixture 8 oz total	E	E	E	E	E	E	E	E	E	P	P	P	P	P	E	P	P	P	P	E	G	F
DROP PIPE OR SKID SPRAY Linuron 1 lb + 1 qt oil	E	E	E	E	E	E	E	E	E	E	F	E	G	E	F	E	F	G	F	G	F	G

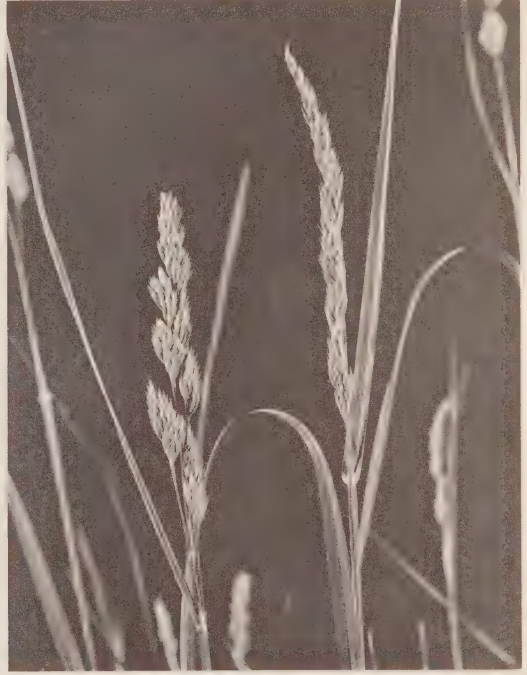
FORAGE CROPS

Choosing A Seed Mixture

Success with a seed mixture depends upon the correct selection of the legume and the grass components to suit the conditions under which the mixture will be grown. Simple mixtures containing one legume and one or two grasses are recommended as they are more productive than complex ones. Pure sowings of a legume or a grass are recommended under special conditions.

The selection begins with the choice of a legume to

suit the intended use, soil drainage conditions, and the duration of stand desired. The suitability of each legume can be determined by reading the information provided about mixtures based on each legume. Once the legume base has been established the specific mixture and the varieties for use in the mixture can be chosen from the recommendations under Alfalfa, Trefoil, Ladino and Red Clover. Grass species and varieties for use in mixtures with legumes or as pure stands of grass are described under grasses.



ALFALFA-BASED MIXTURES

ALFALFA-BASED MIXTURES are intended for use in stored-feed and greenfeeding programs because they produce more hay, silage or green chop than any other mixture. Given good management including adequate phosphorus, potash and proper cutting management, high yields of quality livestock feed will be produced for periods up to four years. When used as pasture, these mixtures are for short-term stands only because alfalfa may thin out in two or three years. For the highest production and best persistence alfalfa mixtures should be used on well-drained soils.

Both early (Flemish) and medium maturing (Standard) alfalfa-based mixtures can be used on the farm to permit staggering of the harvest dates. The early maturing varieties develop quickly in the spring and provide more and earlier aftermath than medium maturing varieties.

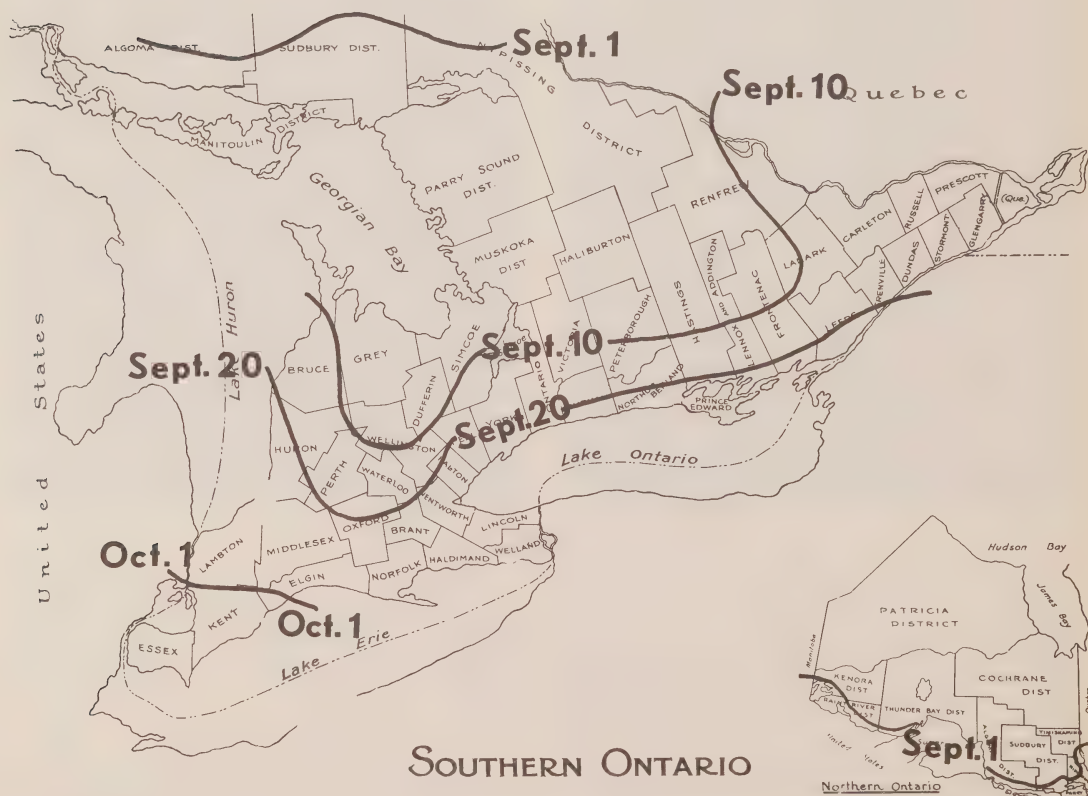
The medium maturing varieties are recommended for stored feed and pasture mixtures that mature later than those using early varieties. Some of the medium maturing varieties are preferred where winter-killing is a problem, drainage is variable, or when a pasture mixture is to be seeded.

Management

1. Alfalfa-based mixtures may be seeded with or without a companion crop. Where high forage yields are required in the seeding year **do not** use a companion crop. Weeds must be controlled (see Weed Control, Page 30). When a companion crop is desired use oats at $1\frac{1}{2}$ bu per acre. Remove the oat crop by controlled grazing or for stored feed if forage establishment is a problem.

2. For stored feed cut at very first flower stage to obtain high quality feed.
3. For pasture alfalfa must not be overgrazed. Rotational or strip grazing with adequate rest periods improve the persistence of the stand.
4. High soil levels of phosphorus and potassium are required for high yields and maintenance of the stand. See Page 26 for fertility recommendations.
5. Alfalfa used for stored feed or pasture must store food reserves in its roots during the fall in order to survive the winter and to regrow the following spring. When the crop is cut or grazed the food reserves in the root decline for three weeks, succeeded by a three-week replenishment period.

Since the growing period in Ontario varies from 175 to 220 days, the date when alfalfa leaves can no longer manufacture food for reserve storage also varies. Consequently in each climatic region of Ontario, alfalfa must be harvested early enough that the reserve cycle is completed or late enough that no regrowth occurs to deplete the reserves. The greatest damage occurs from harvesting at the **critical fall harvest date**. Following such a harvest, the food reserves decline but the accumulated effects of severe frosts kill the leaves and prevent reserve replenishment. Consequently, the alfalfa crop goes into the winter with the lowest possible food reserves and is therefore very subject to winterkill.



To ensure persistence and succeeding yields do not harvest alfalfa for three weeks before or after the critical fall harvest date shown on the map for each region.

RECOMMENDED MIXTURES

Components	Seed Rate	Use Recommendation
STORED FEED (high dry matter silage or hay) and GREEN CHOP		
Alfalfa alone	12	(Up to four years.) A special seeding for high protein-energy feed. Use only on fields where alfalfa is known to do well. High levels of fertility and control of weeds (see Page 30) are necessary. Harvest at first flower stage and store as high dry matter silage, or well-cured hay. Use early or medium maturing varieties.
Alfalfa	10	(Up to four years.) An excellent mixture for most regions. Well suited to dry environments. Recommended over alfalfa-timothy for farms having more than 3100 heat units. Use early- or medium-maturing varieties.
Bromegrass	8	
Alfalfa	10	(Up to four years.) For fields where aftermath is not required as pasture but where high quality stored feed is the main consideration. Use this high-producing mixture as one of a series to diversify the maturity date of mixtures on the farm. Use with medium-maturing alfalfas.
Timothy	6	
Alfalfa	10	(Up to four years.) For use on farms where bromegrass is being seeded for the first time. Use standard type alfalfa.
Timothy	4	
Bromegrass	6	
Alfalfa	10	(Up to three years.) For use on part of acreage where cutting and/or grazing can be matched with maturity of the varieties used. This early-maturing mixture demands early cutting for high digestibility and to best utilize the rapid recovery and high aftermath yield. Use early varieties only. Where ladino is adapted, ½ lb ladino can be added.
Orchard	6	
PASTURE		
Alfalfa	8	Generally not as productive after three years due to alfalfa thinning. For use as part of pasture acreage and for hay-pasture. Use in combination with mixtures containing orchard to help spread pasture production period. In Northern Ontario replace ladino with 2 lb white Dutch clover.
Ladino	2	
Timothy	4	
Bromegrass	8	
Alfalfa	8	Use in conjunction with above mixture to spread pasture production. Alfalfa, orchard, and brome give good production under dry conditions.
Ladino	2	
Orchard	3	
Bromegrass	8	
Alfalfa	8	High fertility and good management are necessary for top production. Alfalfa is included as insurance against dry conditions.
Ladino	2	
Orchard	8	

DESCRIPTION OF ALFALFA VARIETIES

Both medium-maturing and early alfalfas are recommended for Ontario. The early types flower 2 to 5 days earlier than the medium types, recover faster after cutting, and produce a higher-yielding aftermath. Some early varieties are less winter-hardy and are shorter-lived than the medium types. Unless they are wilt-resistant these early strains are recommended for two years only. For the seeding year (following direct seeding) and for the first or second harvest year, early types often outyield the medium types slightly.

SARANAC. This early variety is wilt-resistant and quite winter-hardy. Its persistence, excellent yield, and rapid aftermath recovery combine to make it one of the most attractive varieties available to Ontario farmers today.

ALFA, DUPUITS, GLACIER. These three early varieties, all being susceptible to bacterial wilt*, are recommended for short-term stands of two or possibly three years only.

IROQUOIS, TITAN, VERNAL. These three medium-type varieties are winter-hardy, wilt-resistant and per-

sistent. They provide better yields over a longer period of time than the earlier varieties, but the rate of aftermath recovery is slightly slower. Iroquois is better adapted than Vernal to fields with inadequate drainage and, in general, has a better aftermath recovery rate. Titan has performed as well as the other two in research tests and is essentially equivalent to Vernal.

NARRAGANSETT. This robust medium type variety has been a favorite on some heavier soils, but, being wilt-susceptible*, it is anticipated that it will be gradually replaced by its near-relative, Iroquois.

Seed supplies of Saranac, DuPuits, Glacier and Vernal are adequate. Those of Alfa, Iroquois, Titan and Narragansett are moderate.

**Bacterial wilt of alfalfa is caused by a specific type of bacteria. These organisms gain entrance to the roots through breaks in the skin and in susceptible varieties they multiply in the roots and clog up the water-transporting vessels. Affected plants begin to show symptoms of the disease in the summer of the second year, especially if the season is dry. Diseased plants appear wilted, unthrifty, and sometimes yellowish. If the bark of the roots is peeled back, discolorations will be found on the outside of the core. Such plants may live on for another year but their contribution to yield is small.*

ALFALFA VARIETY RECOMMENDATIONS

Variety	Maturity	Summer Regrowth	Wilt Reaction	Hardiness	Persistence	Suggested Grass
Saranac	early	rapid	resistant	very good	very good	} Brome Orchard
Alfa	early	rapid	susceptible	very good	good, (2 to 3 years)	
DuPuits	early	rapid	susceptible	good	good, (2 to 3 years)	
Glacier	early	rapid	susceptible	very good	good, (2 to 3 years)	
Vernal	medium	medium	resistant	excellent	excellent	} Brome Timothy
Iroquois	medium	medium	resistant	excellent	excellent	
Titan	medium	medium	resistant	excellent	excellent	
Narragansett	medium	medium	susceptible	excellent	very good	

Alfa, DuPuits and Glacier may be removed from recommendations in 1972.

TREFOIL-BASED MIXTURES

TREFOIL-BASED MIXTURES are intended for use in pasture, stored feed or greenfeeding programs. They should be used only for stands of three or more years' duration.

Trefoil-based mixtures serve admirably where alfalfa is not suited because of reseeding difficulties on steeply roll-

ing or stony land, or where alfalfa grows poorly due to wet or acid soil conditions.

Under high fertility and well-drained conditions, established trefoil annually produces somewhat less forage than alfalfa. However, trefoil stands have been known to be productive for 20 years. The no-bloat feature makes trefoil an excellent long-term pasture legume.

Management

1. Vigorous seedlings are obtained by eliminating the nurse crop, controlling weeds, and applying adequate phosphorus and potash.
2. Stands often require one year following seeding to reach maximum productivity.
3. For silage or hay harvest at early flower stage. Exercise care during harvest in order to reduce leaf loss.
4. Productive stands require annual fall application of phosphorus and potash.
5. Protection from close grazing or harvest in September is essential for good production in the following year.

RECOMMENDED MIXTURES

Components	Seed Rate	Use Recommendation
STORED FEED (high dry matter silage or hay) or GREEN CHOP or PASTURE		
Trefoil alone	10	Special seedings for: (A) energy and protein feed where long-term stands are required under drainage conditions unsuited to alfalfa. High levels of fertilizer and weed control (see Publication 75, Guide to Chemical Weed Control) are required. Production in seeding and first harvest year may be low but subsequent harvests should be good. Direct seedings are always preferred. Expect production for 10 years or more from well-managed stands. (B) Use in renovating low-producing, rough or untillable pastures. By applying trefoil, fertilizer and herbicides transform these fields into more productive grassland in a period of two years. Free from the danger of bloat.
Trefoil	8	(Three or more years.) For long-term stands on fields not suited to regular rotations. Use Viking for early and Empire for late hay. This mixture is suitable also for use on acid soils. Use Empire for long-term pastures especially under variable or wet soil conditions. Free from danger of bloat.
Timothy	2	

DESCRIPTION OF TREFOIL VARIETIES

Four varieties are now recommended for Ontario. These four differ in seedling vigor, growth habit, maturity, hardiness, area of adaptation, and in their ability to withstand flooding and poor drainage. They are all approximately equal in yield potential.

EMPIRE, currently the most widely used trefoil variety in Ontario, is both winter-hardy and tolerant of inadequate drainage. It is somewhat deficient in seedling vigor but once established it can be depended on to persist for many years. It is recommended for all parts of the province and is especially valuable as a long-term pasture crop in Southern Ontario. Empire blooms 10 to 14 days later than medium-maturing alfalfa and 12 to 16 days later than Viking. Seed supplies are adequate.

LEO is a robust variety with better seedling vigor than Empire, excellent winterhardiness, and good tolerance to inadequate drainage. It blooms 6 to 8 days later than Viking, and 4 to 6 days earlier than Empire, has a more vigorous growth habit in the spring than Empire, and a

faster aftermath recovery rate, but it terminates its growth earlier in the fall than the other varieties. It is recommended for all parts of Ontario for both hay and pasture. Seed supplies are limited for 1971.

VIKING has a more upright growth habit than either Empire or Leo. It has more seedling vigor, starts growth earlier in the spring, and has a better aftermath recovery rate than Empire. However, it is less winter-hardy and will not withstand poor drainage. It is not recommended for use in northern Ontario but is useful, either as hay or as hay aftermath pasture, on sites in southern Ontario where drainage is not a problem. Viking comes into bloom at about the same time as early alfalfa. Seed supplies are limited for 1971.

MAITLAND, a new variety for 1971, is essentially equivalent to Viking in growth habit, yield and recommended usage. Maitland possesses a little more seedling vigor and hardiness than Viking. Seed supplies are limited for 1971.

BIRD'S-FOOT TREFOIL VARIETY RECOMMENDATIONS

Variety	Date of First Flower at Guelph	Regrowth	Tolerance to Variable Drainage	Suggested Grass
Empire	July 1	Slow	Excellent	Timothy
Leo	June 23	Medium	Excellent	Timothy
Viking	June 15	Medium	Poor	Timothy
Maitland	June 16	Medium	Poor	Timothy

LADINO-BASED MIXTURES

LADINO CLOVER MIXTURES perform best as pastures, particularly in areas where moisture is plentiful and winterkilling is not a problem. They are difficult to cure as hay but make excellent silage. Orchard grass performs

well in combination with ladino, making an early-maturing mixture. Ladino pasture presents a bloat hazard unless it is combined with grasses (e.g. orchard grass) that are productive at the same time.

Management

1. Where protein feed is sought, harvest and ensile before blooms appear.
2. Restrict grazing in autumn to leave protective cover of leaves and grasses on overwintering creeping stems of ladino.
3. Controlled grazing management helps the stand remain productive for a period of years.

RECOMMENDED MIXTURES

Components	Seed Rate	Use Recommendation
STORED FEED		
Ladino	4	(For one year.) For protein production on fertile, moist soils. Makes excellent silage. Ladino has the highest content of protein among the legume forages. Four cuttings could be harvested, beginning about the end of May. Ladino is difficult to cure for hay.
PASTURE		
Ladino	2	Not often productive after three years. Use where ladino is adapted. Ladino and orchard grass grow best when moisture and winterkilling are not problems. High fertility and good management required for top production. In dry areas add 8 lb alfalfa.
Orchard	8	

LADINO VARIETY DESCRIPTION

MERIT Ladino clover is the result of an Iowa selection program emphasizing yield, winterhardiness, and tolerance to summer drought. In tests across Ontario it has out-yielded, on the average, all other Ladino strains. When moisture is plentiful and temperatures are normal, it re-

covers more rapidly after cutting or grazing than common white clover. It is at least as hardy as Certified Ladino imported from the United States, and is recommended for use wherever Ladino is used in Ontario. There is an adequate supply of seed for 1971.

LADINO VARIETY RECOMMENDATIONS

Variety	Date of First Flower at Guelph	Regrowth	Tolerance to Variable Drainage	Suggested Grass
Merit	June 10	Rapid	Good	Orchard grass

RED CLOVER-BASED MIXTURES

RED CLOVER-BASED MIXTURES are suited only for short-term stands for stored feed. Red clover produces well for one year and sometimes slightly in the second

harvest year. Early disappearance of red clover leaves grass alone to produce. Do not use in pasture mixtures.

Management

1. Harvest for stored feed at early bloom if top quality feed or a seed crop is expected from aftermath.
2. Recommended for short-term stands only. They can produce longer provided nitrogen is applied for the grass in the second and subsequent years.

RECOMMENDED MIXTURES

Components	Seed Rate	Use Recommendation
STORED FEED		
Red Clover	6	(One year.) For fields where hay is the main consideration. Little clover can be expected in the second year. If mixture maintained, fertilize with nitrogen for second and subsequent harvest years.
Alsike	2	
Timothy	6	
Red Clover	6	(One year.) For short-term stands of hay. If kept more than one crop year, use nitrogen in order to maintain production, but recognize the higher cost of the hay.
Timothy	6	

RED CLOVER

DOLLARD, LAKELAND and OTTAWA. These three varieties are very similar in yield, maturity and persistence. They are more persistent in the second year of production than Canadian double-cut, and are recommended where stands will be harvested for two years. Seed supply is limited for 1971.

HUNGAROPOLI is a new hardy variety introduced from Europe that matures later than Dollard. Because it

is susceptible to **powdery mildew** it is recommended for use in **Northern Ontario only**. Seed is in moderate supply for 1971.

CANADIAN DOUBLE-CUT red clover is uncertified seed produced in Canada. For one harvest year it is equal in yield to Dollard, Lakeland and Ottawa. Canadian double-cut is superior to imported seed of British or U.S. origin.

RED CLOVER VARIETY RECOMMENDATIONS

Variety	Date of First Flower at Guelph	Regrowth	Tolerance to Variable Drainage	Suggested Grass
Dollard	June 18	Medium	Good	Timothy
Lakeland	June 18	Medium	Good	Timothy
Ottawa	June 18	Medium	Good	Timothy
*Hungaropoli	—	Medium	Good	Timothy

*For use in Northern Ontario only — susceptible to mildew

GRASSES

GRASSES USED IN MIXTURES WITH LEGUMES should be in the boot stage of growth or have the heads just emerging when the legumes reach first flower to ensure best yields of top-quality forage. Grasses that reach the boot to heading stage of growth at the same time as the various legumes are suggested in the legume and grass variety recommendations.

PURE GRASS STANDS including mixtures of grasses or one species perform well where legumes cannot be included because of poor drainage or extremely acid conditions. They require large amounts of nitrogen to provide high yields. Split applications of nitrogen are preferred, e.g. one application after each harvest.

Management

1. Apply 50 lb per acre of nitrogen early each spring, and again after each cutting.
2. Harvest the grass at the "heads just emerged" stage of growth for top-quality stored feed.
3. Where grasses are included in mixtures with legumes, harvest according to the recommended stage of the legume and fertilize for the legume (see Page 26).

RECOMMENDED SEEDING RATES

Pure Stand Of	Seed Rate Lb/Ac	Use Recommendation
Reed Canary	8	Use where legumes are not suited. The adaptation of each species is outlined in the following species descriptions. High soil levels of nitrogen, phosphorus and potassium are required for good production of pure grass stands.
Brome	10	
Timothy	8	
Orchard	8	

DESCRIPTION OF GRASS SPECIES AND VARIETIES

BROMEGRASS is important for early and late cut hay. Harvested at the recommended "heads emerged" stage, it is higher in digestibility than timothy. At more advanced stages of maturity it is higher in digestibility than any other species. Furthermore, brome produces slightly more aftermath than timothy and combines very well in alfalfa mixtures.

For early pasture brome grass is superior to any of the other forage grasses. Used in mixtures it permits early grazing in the spring and good growth during the summer, but can be faulted for lack of growth in the fall. As a general hay and pasture crop, however, brome grass is a very important Ontario forage.

Clipped brome seed will be available from some sources again this spring. It is seed which has been trimmed mechanically to remove part of the hull and allow it to feed through the seeder better than unclipped seed. It flows better, is easier to sow, and gives a more uniform distribution than is usually the case with brome grass seed.

BAYLOR, REDPATCH and SARATOGA. These three varieties are recommended above all other varieties for all brome plantings. They are high in seedling vigor, early spring growth and aftermath. Seed supplies of any individual variety may be in limited supply; however, since the three varieties can be readily interchanged the total seed supply should be adequate for 1971.

These varieties are strong competitors and are the only good brome varieties for mixtures with early varieties of alfalfa. In pasture mixtures or with early alfalfa, orchard grass is a good alternative to these varieties.

LINCOLN. This variety is less vigorous than the other three, but higher in yield than Canadian Commercial. Seed supply for 1971 is limited.

ORCHARD GRASS is an early-maturing forage that grows and matures well with early alfalfa varieties or Ladino clover. Cut for stored feed, it is higher in digestibility than brome or timothy harvested at comparable stages.

Orchard grass grows back immediately after cutting or grazing. It is our best grass for aftermath production, and is capable of counteracting the bloating effect of alfalfa and the clovers. In well-managed pasture and hay-pasture mixtures, orchard grass makes very palatable food. Its fast growth and good production, however, must be fully utilized. It is an excellent grass for the good grass-land man on well-drained sites. Surface drainage to take runoff is necessary to maintain stands.

FRODE and TARDUS II. These two Swedish varieties are equal in performance. They are higher in yield and more leafy than most seed lots of common. There is an adequate seed supply of both varieties for 1971.

RIDEAU. This variety is 5 to 10 days later in maturing, and leafier than Frode and Tardus II. It is slightly lower in yield. Seed supplies for 1971 are limited.

TIMOTHY has long been the basic meadow grass in Ontario. Timothy grows under a wider range of environments than any other grass used, and is easy to establish and maintain. It is well adapted to the heavier soil types and variable drained fields. Cut at the heading stage, timothy is a high-yielding, high quality grass, for hay. Like all grasses, it contains about half the crude protein content found in alfalfa. For pasture or in hay aftermath, timothy is a lower producer than orchard or brome. Palatable and high-yielding in the spring, it grows back slowly after cutting or grazing, and produces relatively poor growth during the dry midsummer. However, timothy adds stand insurance and consequently small to moderate amounts are useful when making new seedings with legumes.

CHAMP, which is earlier than Climax, will give a quarter more aftermath production than Climax under good moisture and fertility conditions. It would be preferred for long-term hay-pasture or pasture mixtures. Seed supplies are adequate for 1971.

CLIMAX. This variety is later and leafier than common. Seed supplies are adequate for 1971.

MILTON. Recommended for the first time in 1971. Milton is similar in yield, maturity and aftermath production to Climax and can be used in the same mixtures as Climax. Milton often appears to be less leafy than Climax. Seed supplies are adequate for 1971.

REED CANARY GRASS, although adapted to dry upland soils, is used only on land subject to prolonged periods of flooding. Slow to establish, stands thicken after the first year and generally resist weed invasion. The very tall coarse growth obtained from reed canary is best utilized

for stored feed in the form of silage or haylage. As dry hay, it lacks in palatability unless cut no later than early heading. It produces good aftermath yields.

For pasture, reed canary grass is low in palatability. Cattle accept it more readily, however, if it is well fertilized. Although it is a good pasture producer on wet land, it should not be used if the land will grow bird's-foot trefoil.

FRONTIER. This variety is higher yielding than the common type but seed supply is limited in 1971.

GRASS VARIETY RECOMMENDATIONS

Variety	Heading Date Guelph	Aftermath Recovery	Aftermath Production	Tolerance to Variable Drainage	Suggested Legume
BROMEGRASS					
Baylor	June 15	Medium	Good	Fair	Early or
Redpatch	June 15	Medium	Good	Fair	Medium
Saratoga	June 15	Medium	Good	Fair	Alfalfa
Lincoln	June 15	Slow	Fair	Fair	Medium Alfalfa
ORCHARD GRASS					
Frode	June 8	Rapid	Excellent	Poor	Early Alfalfa
Rideau	June 12	Rapid	Excellent	Poor	or
Tardus II	June 8	Rapid	Excellent	Poor	Ladino clover
TIMOTHY					
Champ	June 20	Medium	Good	Good	Medium Alfalfa
Climax	June 24	Slow	Fair	Good	or Bird's-foot Trefoil
Milton	June 24	Slow	Fair	Good	or Red clover
REED CANARY GRASS					
Frontier	June 10	Medium	Excellent	Excellent	None

Annual Crops for Forage in Southern Ontario

SPRING PASTURE

AUTUMN-SEEDED FALL RYE, seeded at $2\frac{1}{2}$ bu per acre, can be grazed for a short period in the spring, preferably after the stems start to form. Keep stock off when wet. Another pasture or green chop crop (e.g. corn) may follow the rye in intensive programs.

SUMMER GREEN CHOP OR PASTURE

CORN. Seeded early in May. Use hybrid seed or grain from the crib if germination is satisfactory. Seeding rate of 60 lb per acre is adequate. No aftermath can be expected. Controlled grazing (e.g. fresh daily) makes the most efficient use of the crop when pastured after it reaches a height of 36 inches.

OATS. Seed any time in the season to produce pasture in eight weeks. Use $2\frac{1}{2}$ bu per acre. Graze when stems are forming. No aftermath can be expected.

SUDAN-SORGHUM HYBRIDS or HYBRID SUDAN GRASSES. Seed in mid-May to early June at 12 lb per acre in 7- or 14-inch rows; ready to harvest in early August. Do not graze before growth is 24 inches high or during periods of severe drought or for three days following a frost, as prussic acid poisoning could occur. If frozen, graze only after a couple of days following the last frost. High aftermath yield possible only in hot, moist conditions or after very early first harvest.

AUTUMN PASTURE

OATS. Seeded at $2\frac{1}{2}$ bu per acre before August 15, ready for grazing by October 1.

RAPE. Seed in early July at $1\frac{1}{2}$ lb per acre in 28-inch rows. May be seeded in solid stands, but yields are 25% lower. Pasture in late October. Makes good hog, sheep or beef pasture. Taints milk.

FALL RYE. Seeded by August 1, at $2\frac{1}{2}$ bu per acre, gives good fall pasture by October 1.

SILAGE CROPS

Any of the annual forages can be made into silage. The immature crop commonly has lower yield than the mature crop. Corn is the most important silage crop.

Fertilizers for Hay and Pasture Crops

Forage crops have the capacity to produce high yields of total digestible nutrients (TDN) per acre. To obtain high yields, high fertility levels are required. Legumes, with the possible exception of bird's-foot trefoil, generally are not tolerant of acid soil conditions. Acid soils (pH 6.0 or lower) should be limed one year before seeding, at rates indicated by soil tests. Spreading manure on snow may cause an ice pack to form under the manure and smother the legumes (alfalfa, trefoil, red clover, ladino).

The timing of fertilizer application may influence the response obtained. An annual broadcast fertilizer application is recommended for established stands. **Phosphorus and potassium are necessary to maintain forage stands.** Potassium is best applied in August or early

September. Phosphorus, if required, may be included or can be applied in the spring or summer. Potassium is particularly important on sandy or loamy soils.

For grass stands nitrogen should be applied as early as possible in the spring. If more than 50 lb of total nitrogen (N) per acre is required, a portion (up to 50 lb of N per acre) should be applied in late August or early September. Nitrogen applied in early fall stimulates tillering and early spring growth. It rarely pays to fertilize old bluegrass pastures. It is profitable to fertilize grass stands consisting of productive grasses such as brome, orchard or timothy. However, it is usually profitable to reseed grass stands to a suitable legume rather than to fertilize them.

Fertilizer needs should be determined from a soil test. The fertilizer rates suggested from soil tests are designed to produce highest economic yields when accompanied by good or above-average management. The following general fertilizer recommendations should be followed only when a soil test report is not available.

FERTILIZERS FOR HAY AND PASTURE CROPS

Crop	Conditions	Soil	Recommended Plant Food (lb per acre)			Ratio	Suggested Recommendation	
			N	P ₂ O ₅	K ₂ O		Analysis	Rate
NEW SEEDING At Planting	— Seeded with a companion crop OR direct-seeded without a companion crop	Sandy or Loamy	15	60	60	1-4-4	6-24-24	250
		Clay	15	60	30	1-4-2	8-32-16	200
Fall Topdressing	— Seeded with a companion crop OR direct-seeded without a companion crop	Sandy or Loamy	0	40	120	0-1-3	0-10-30	400
		Clay	0	40	40	0-1-1	0-20-20	200
ESTABLISHED STANDS Legumes	— Legumes occupy one- half or more of the stand (6 or more plants per sq ft)	Sandy or Loamy	0	40	120	0-1-3	0-10-30	400
		Clay	0	40	40	0-1-1	0-20-20	200
Legumes	— Legumes occupy one- third to one-half of stand (3 to 5 plants per sq ft)	Sandy or Loamy	30	40	120	0-1-3	0-10-30 plus Ammonium Nitrate	400 100
		Clay	30	40	40	0-1-1	0-20-20 plus Ammonium Nitrate	200 100
Grass	— Legumes occupy less than one-quarter of stand (2 or less plants per sq ft)	Sandy or Loamy	120	40	120	0-1-3	0-10-30 plus Ammonium Nitrate	400 375
		Clay	120	40	40	0-1-1	0-20-20 plus Ammonium Nitrate	200 375

NOTE: Where manure is applied (10 or more tons per acre) reduce the rate of fertilizer application to ONE-HALF of the suggested recommendation.

INSECT CONTROL IN FORAGE CROPS

(See also Pages 54 to 55)

ARMYWORM. Maintain a close watch for outbreaks in grasses in late June and July. If they become destructive, control them as indicated on Page 39 under "Grain Crops".

CEREAL LEAF BEETLE. Refer to Page 39 (Grain Crops section) concerning movement of hay.

ALFALFA WEEVIL is now distributed throughout all of southwestern Ontario (40 counties). It is expected that half of the alfalfa grown in this region will require a control measure in 1971. The counties closest to the lakes are the most heavily infested.

The key to weevil control is proper timing of harvest and treatment, based on field inspection. Examine each field twice a week from mid-May to mid-June. Check about eight areas of one square yard each. Half of these should be near the edges and the remainder scattered within the field. This procedure is necessary because insect populations can vary considerably within a field and between nearby fields.

First cut — Cut early (just before first bloom opens) and **remove** from the field as soon as possible. However, if 25 to 50% of the leaves on the upper third of the stems show feeding injuries **and it is not possible to cut the crop immediately**, treat with one of the recommended

insecticides — subject to consideration of the important notice below (re Use of Insecticides).

Second cut — Carefully check the early regrowth (aftermath). If damage was readily apparent in the first cut, larval survival and feeding may continue. If feeding is readily evident, apply an insecticide to the stubble and new growth. Refer to notice below.

USE OF INSECTICIDES

1. From experiments conducted in Ontario it was determined that insecticides will pay only if a forage stand consists of at least 50% alfalfa.
2. The alfalfa weevil has declined to harmless levels in Quebec and several northeast States. Parasites (tiny wasps) introduced into these regions may well be responsible for the decline. Several species of parasites are now established in Ontario. The use of insecticides will kill and thus hinder their buildup. Only when large populations of the parasites are present will they be able to exert a controlling influence on the weevil.

See Pages 54 and 55 for information on the proper use of pesticides, time interval between treatment and harvest or grazing to prevent residue problems, and spray equipment.



Moderate to heavy feeding damage by alfalfa weevil larvae

INSECTICIDES RECOMMENDED FOR USE IN ALFALFA WEEVIL CONTROL

Insecticide Formulation	Rate per Acre	Minimum Days To Cutting	Comments
1. malathion 50% EC	1½ to 2 pints	1	Less effective below 60°F. Hazardous to bees.
2. carbaryl (Sevin) 80S	2 lb		
or 85W	1¾ lb	1	Crop injury possible if applied when hot, humid, or wet. Very toxic to bees. Wettable powders cannot be applied with low gallonage equipment (4 to 45 gal per acre).
or 50 WP	3 lb		
3. methoxychlor 24% EC	5 pints		
or 50% WP	3 lb	7	Relatively safe to bees. Wettable powders cannot be applied with low gallonage equipment (4 to 45 gal per acre).
4. Imidan 50% WP	2 lb	7	Do not apply when crop is in bloom.
5 Carbofuran (Furadan) 4.8 F	4 fl oz	14	Highly toxic to bees.

EC — Emulsifiable Concentrate; S — Sprayable; WP — Wettable Powder; F — Flowable

If you propose to spray an in-bloom forage crop,
heed the warning about bees on Page 54.

CHEMICAL WEED CONTROL IN FORAGES

Always read and follow the instructions which the manufacturer has printed on the herbicide label. This will give you further information on how to apply the chemical and on conditions which will affect results. This can save you money and help prevent crop damage.

Forages	Weed Situation	Chemical	Rate per Acre Active Ingredient	Remarks
Wheat, Oats, Barley Underseeded to:				
Grass seed- lings	Many broadleaf weeds	2,4-D (Amine) or MCPA or 2,4-DB or MCPB	not over 6 oz not over 8 oz not over 20 oz not over 20 oz	While seedling grasses are more resistant to 2,4-D than legumes, they should be well established before spraying.
Alfalfa — Medium maturity	Many broadleaf weeds	2,4-D (Amine) or MCPA or 2,4-DB	not over 2 oz not over 4 oz not over 20 oz	Rates of 2 to 4 oz 2,4-D or 4 oz MCPA are useful if common mustard or other very susceptible weeds dominate the stand. When using these materials it is necessary to have a canopy of cereal or weed leaves to protect the legumes. Do not use pressures over 40 psi.
Alfalfa — Early maturity*	Many broadleaf weeds	2,4-DB	not over 20 oz	The rates of 2,4-DB or MCPB shown will give better control of many broadleaf weeds, including Canada thistle, than the rates of 2,4-D or MCPA. 2,4-DB or MCPB should be applied when the legumes are in the 1 to 3 trifoliate stage. Later applications may check the legumes severely. Under drought or other stress conditions 2,4-DB may injure seedling legumes.
Red, Alsike, or Ladino Clover	Many broadleaf weeds	2,4-D (Amine) or MCPA or 2,4-DB or MCPB	not over 4 oz not over 4 oz not over 16 oz not over 20 oz	Mixtures of MCPB and MCPA (15:1) should be used instead of MCPB where mustard is a problem. 2,4-DB will kill mustard if applied when the mustard is 1 to 2 inches high.
Bird's-foot Trefoil	Many broadleaf weeds	2,4-D (Amine) or 2,4-DB	not over 4 oz not over 16 oz	MCPB is safer on red and alsike clover than 2,4-DB and should be used when these clovers are seeded alone or when they dominate the seedling stand. When alfalfa dominates in a red clover alfalfa mixture use the 16 oz rate of 2,4-DB.

Alfalfa and grass seedlings

Many broadleaf weeds including smartweed and wild buckwheat

Bromoxynil

6 oz

Apply at the 2- to 4-leaf stage of weed growth before the cereals have more than 5 leaves.

Since BROMOXYNIL moves very little within the plant, it is necessary to cover the weeds thoroughly with spray. A higher rate of water should be used when the weeds are in the 4-leaf stage or partly covered by the cereal leaves. BROMOXYNIL usually causes some burn of the legume leaves but new growth usually appears quickly. (Registration pending.)

Seeded without a companion crop

Alfalfa with or without forage grasses

Many broadleaf weeds

2,4-DB

12 to 16 oz

2,4-DB should be applied when the legumes have no more than 3 true leaves. Usually suppresses legume growth for a period of 2 to 3 weeks. Under drought, high temperature or other stress conditions, 2,4-DB may severely injure seedling legumes.

Many broadleaf weeds including smartweed and wild buckwheat

Bromoxynil

6 oz

Apply when the weeds and alfalfa are in the 2- to 4-leaf stage of growth. Usually causes some burn to leaves of alfalfa seedlings but new growth appears quickly. Do not apply during severe drought or when temperatures are 80°F or higher. Use 20 gal water/acre to assure good weed coverage. (Registration pending.)

Pure stands of Alfalfa and Bird's-foot Trefoil

Many annual grasses

Dalapon

4 lb (product)

Apply to emerged grass when the legume seedlings have not more than 3 true leaves. Do not graze or feed foliage treated with DALAPON to meat or dairy animals during the crop year of application.

Nut sedge and many germinating grass and broadleaf weeds

EPTC (EPTAM)

3 lb

Preplant-incorporated. EPTC should be applied to a dry soil surface and incorporated into the soil immediately (within 10 minutes) with a double disk. A second incorporation at right angles with a disk in tandem with a harrow should be done as soon as possible.

*The varieties DuPuits, Alfa, Saranac, and Glacier are early-maturing alfalfa.

Forages	Weed Situation	Chemical	Rate per Acre Active Ingredient	Remarks
Established Legumes				
Pure stands and mixture containing Alfalfa or Bird's-foot Trefoil	Canada thistle and chicory	2,4-DB	16 to 20 oz	Spot treatment only. Do not use if crop is intended for seed production later in season. Apply when weeds are in the 2- to 3-leaf stage. Apply in early spring or after cutting, or in the fall after legumes become dormant.
Pure stands and mixtures containing Red or Alsike Clover	Canada thistle and chicory	MCPB	16 to 24 oz	Spot treatment only. Do not use if crop is intended for seed production later in season. Apply when weeds are in the 2- to 3-leaf stage. Apply in early spring or after cutting, or in the fall after legumes become dormant.
Alfalfa and Trefoil seed fields	To prevent seeding establishment	Simazine	1 lb	Apply from September to November only. Prevents the establishment of legume and weed seedlings. Do not apply paraquat within 1 year after the SIMAZINE treatment.
	Suppression of grasses, red clover, and alsike clover	Dalapon	5 lb (product)	Applied in the fall when growth is about 6 inches high. Spring treatments may result in seed yield reduction.
Alfalfa and Trefoil	Control or suppression of grasses and annual weeds	Paraquat (Gramoxone)	½ to 1 lb	Apply to trefoil for seed when the trefoil is 3 to 6 inches high in the spring. Apply to alfalfa or trefoil for forage within 5 days after cutting. PARAQUAT should not be applied within 1 year after a SIMAZINE treatment. PARAQUAT kills the foliage it contacts but most perennials recover from this treatment.

GRAIN CROPS

Grain crops deserve to be treated as first-rate crops whenever they are included in a cropping program. They must compete for their place in that program by producing high yields economically. To produce high yields requires that all parts of the grain production package be considered. No one factor can support high yields without the others. No one factor can be neglected without a corresponding decrease in yields.

Improved varieties express their full potential only when

they are used in combination with proper seeding times, seeding depth, and recommended seeding rates as well as adequate fertility applications. Indeed they perform well only when diseases, insects, and weeds are eliminated as production hazards.

Integrating the production practices into a package becomes the problem of the farmer. On his ability to do this rests the final yield and outcome of his grain production program.

1971 Grain Variety Recommendations

Variety recommendations are general guides for choosing a variety. Descriptive tables accompanying recommendations show characteristics for each variety which may limit its use. Because no variety is perfect, the recommendations should be coupled with experience and information from the description to choose a variety for your use.

Yield data, presented as hundredweight (cwt)/acre, is included to indicate the relative yield performance of recommended varieties in each of the six testing areas in Ontario. The testing areas are listed below and can be outlined by using the heat unit map on Page 6.

Test Area I — Southwest of the 2900 heat unit line.

Test Area II — West of Frontenac, between the 2900 and 2300 heat unit lines.

Test Area III — East of Frontenac, between the 2900 and 2300 heat unit lines.

Test Area IV — The Dundalk plans (Grey, Dufferin and Wellington) within the 2500 heat unit line.

Test Area V — Northern Ontario between the 2300 and 1900 heat unit lines.

Test Area VI — Northern Ontario — north of the 1900 heat unit line.

Variety recommendations for grains to be stored and used as high moisture grains and whole plant silages are the same as those to be used for normal grain storage and use.

SPRING GRAINS

All spring grains respond with higher yields to early seeding. Plant as early as soil conditions permit. The target date for the Guelph area should be April 15.

BARLEY

Recommendations

Varieties for Feed

HERTA	} All areas
BROCK	
KEYSTONE	
CHAMPLAIN	
	All areas where mildew is not a problem
	All areas where lodging and mildew are not problems

Varieties for Feed or Malting

FERGUS	All areas
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Varieties for Malting

CONQUEST	} All areas if malting quality is required
PARAGON	

Barley Variety Descriptions

Variety	Type and Maturity	Height	Lodging Resistance	Reaction to Disease*	
				Loose Smut	Mildew
BROCK (6-row)	Smooth-awned, medium	Medium	Medium	R	R
CHAMPLAIN (6-row)	Smooth-awned 2 to 3 days earlier than Herta	Medium to tall	Medium to weak	T	S
CONQUEST (6-row)	Smooth-awned, midseason	Medium	Medium to good	R	S
FERGUS (2-row)	Rough-awned late	Medium to short	Medium	T	R
HERTA (2-row)	Rough-awned, late	Medium to short	Medium	T	R
KEYSTONE (6-row)	Smooth-awned, midseason	Medium	Good	R	S
PARAGON (6-row)	Smooth-awned, midseason	Medium	Medium to good	R	S

*See also Disease and Insect Control Recommendations, Page 38.

R = resistant; S = susceptible; T = tolerant

Barley Variety Yields* — cwt/acre

Variety	Testing Area					
	I (8) **	II (17)	III (12)	IV (3)	V (8)	VI (3)
Brock	27	30	25	29	30	41
Champlain	30	26	25	27	28	42
Conquest	27	27	23	28	30	40
Fergus	27	28	23	29	29	39
Herta	28	27	23	26	28	39
Keystone	27	30	24	28	30	38
Paragon	26	28	24	28	32	44

*Three-year average (1968-70)

**Number of tests

OATS

Recommendations

GARRY	}	All areas
SIOUX		
DORVAL	}	All areas on farms where lodging is not a problem
STORMONT	}	All areas on farms where lodging is a problem

Oat Variety Descriptions

Variety	Seed Size	Height	Lodging Resistance	Maturity	Reaction to Disease*		
					Septoria	Smut	Rust
DORVAL	Medium	Medium to tall	Medium to weak	3 to 5 days later than Garry	S	S	S
GARRY	Medium	Medium to tall	Medium to good	midseason 2 to 3 days earlier than Herta	S	R	MR
SIOUX	Medium	Medium to tall	Medium	midseason	S	R	MR
STORMONT	Large	Short	Good	2 to 4 days earlier than Garry	T	R	MR

*See also Disease and Insect Control Recommendations, Page 38.

R = resistance; S = susceptible; T = tolerant; MR = moderately resistant

Oat Variety Yields* — cwt/acre

Variety	Testing Area					
	I (7) **	II (15)	III (14)	IV (4)	V (8)	VI* (2)
Garry	29	30	23	28	24	40
Stormont	25	26	20	28	23	33
Dorval	29	30	26	31	27	46
Sioux	28	30	24	27	25	45

*Three-year average (1968-70) except Area VI which is a two-year average (1969-70)

**Number of tests

SPRING WHEAT

Generally spring wheat in Ontario is much lower yielding than winter wheat, oats and barley. For those farmers, however, who choose to grow any spring wheat, the variety **Manitou** is available. **MANITOU** — Awnless, white chaff, red grain. Resistant to stem and leaf rust, and loose smut. Susceptible to mildew. Good lodging resistance.

WINTER GRAINS

For good winter survival, seed early enough to obtain adequate top growth and root development in the autumn. This is particularly important for winter barley.

WINTER WHEAT

Recommendations

GENESEE

TALBOT

YORKSTAR

} All areas in Ontario suitable for winter wheat

Winter Wheat Variety Descriptions

Variety	Bushel Weight	Lodging Resistance	Height	Winter Survival	Reaction to Disease* Loose Smut	Rust
GENESEE	High	Medium	Tall	Medium	MR	S
TALBOT	High	Medium to good	Tall	Medium	MR	S
YORKSTAR	Medium to low	Medium to good	Medium	Medium	MR	S

*See Disease and Insect Control Recommendations, Page 38.

MR = moderately resistant; S = susceptible

Winter Wheat Variety Yields* — cwt/acre

Variety	Test Area		
	I (9)**	II (13)	III (12)
Genesee	38	35	36
Talbot	37	36	37
Yorkstar	41	37	38

*Five-year average (1966-70)

**Number of tests

YORKSTAR: Because of its genetic makeup, Yorkstar has a lower bushel weight than Genesee. Under unfavorable growing conditions bushel weight of Yorkstar could be low enough to cause downgrading when marked as a milling wheat.

WINTER BARLEY

Recommendations

DOVER — Areas south of the 2700-heat-unit line where winter barley can be expected to survive. Winter barley is not as winter-hardy as winter wheat.

DOVER — Strong, short-strawed, high yield, good threshability. Very early maturity. Six-rowed and rough-awned. Susceptible to loose smut, resistant to mildew.

WINTER RYE

Recommendations

TETRA PETKUS — For areas with more than 2300-heat-unit ratings. Tetra Petkus should not be grown in close proximity to common rye as the two cross to give sterility and lowered yields.

IMPERIAL — For areas between the 2300- and 1900-heat-unit lines.

IMPERIAL — Winter-hardy, weak-strawed variety of common rye with light-colored kernels. Pedigreed seed supplies limited.

TETRA PETKUS — A tetraploid variety with strong straw and large kernels. Ontario tests show this variety to be a high-yielding grain or green-manure crop. It is more winter-hardy than winter wheat but less winter-hardy than Imperial.

Fertilizers for Grain Crops (not seeded down)

Fertilizer for cereal crops should be applied in the drill row with a combination fertilizer drill, or with a fertilizer attachment on the drill.

Fertilizer needs of grain crops should be determined from a soil test. The fertilizer rates suggested from soil tests are designed to produce highest economic yields when accompanied by good or above-average management. The following general

fertilizer recommendations should be followed only when a soil test is not available.

Manure, if available, should be used for crops such as corn and forage that give greater response to manure than grain crops.

Where manure is applied reduce the fertilizer recommendation according to the amount and quality of manure applied (see Page 51).

FERTILIZERS FOR GRAIN CROPS (not seeded down)

Crop	Conditions	Soil	Recommended Plant Food (lb per acre)			Ratio	Suggested Recommendation Analysis	Rate
			N	P ₂ O ₅	K ₂ O			
Spring Barley	– Following a crop of less than quarter legumes	Sandy, Loamy or Clay	30	30	30	1-1-1	15-15-15	200
	If preceding crop contains quarter to half legumes	Sandy, Loamy or Clay	8	30	30	1-4-4	6-24-24	150
	If preceding crop contains more than half legumes	Sandy, Loamy or Clay	0	30	30	0-1-1	0-20-20	150
Oats and Mixed-Grain	– Following a crop of less than quarter legumes	Sandy, Loamy or Clay	20	20	20	1-1-1	15-15-15	150
	– Following legume sod OR	Sandy or Loamy	0	20	20	0-1-1	0-20-20	100
	– Where lodging may be a problem	Clay	0	20	0	0-1-0	0-20-0	100
Winter Wheat, Rye, Winter Barley	– Where previous crop is not a legume sod*	Sandy, Loamy or Clay	15	60	30	1-2-4	8-32-16	200
	– Where lodging may be problem OR	Sandy, Loamy or Clay	0	60	30	0-2-1	0-20-10	300
	– Where previous crop is a legume sod							

* Where the crop does not follow a legume sod, apply 40 lb N per acre, e.g., ammonium nitrate at 120 lb per acre, as a topdressing in the early spring before growth begins. If nitrogen cannot be applied in early spring, apply 60 lb per acre in the late fall prior to freeze-up, e.g., ammonium nitrate at 180 lb per acre. The larger amount is required as fall applications are less effective than spring applications.

Disease and Insect Control in Grain Crops

(See also Pages 54 to 55)

DISEASES

OAT NEMATODES. If oat nematodes have caused damage the preceding crop year, do not plant oats or barley (see Publication 453, **The Oat Nematode in Ontario**). Use legume or row crops in the rotation. Corn may be used in the rotation when the nematode population is low but it will suffer damage the first year if the soil is heavily infested. The nematode invades but cannot reproduce in corn roots, thus successive cropping to corn effectively reduces the nematode population.

FUSARIUM HEAD BLIGHT (Scab), CERCOSPORELLA FOOT ROT and TAKE ALL in wheat are a threat in some seasons. Serious damage will be prevented by including one or more of alfalfa, clovers, soybeans, field beans, swede turnips, or oats, in the rotation. Do not grow wheat after wheat, barley, or corn. Plow down stubble and straw to cover all wheat and barley crop residues.

CEREAL RUSTS can be controlled to reduce grain losses. If you regularly have a rust problem on your grain, it is very likely there are common barberry or European buckthorn shrubs close by. These shrubs are hosts of the rust-producing organisms in part of their annual life cycle.

Common barberry is a 6- to 10-foot shrub with three-pronged spines on the stems, saw-toothed edges on the leaves and oblong red berries which hang on the plant through the fall and winter. It is a host for the **stem rust** fungi.

European buckthorn is a shrub or small tree with dark green leaves and round black berries. The leaves hang on till late in the fall and the berries remain most of the winter. It is a host for **leaf rust** fungi.

Rust losses commonly are greatest downwind from the shrubs. At times rust spores are blown in from the United States. Border states, except New York, have eradication programs like that of Ontario.

If rust is a problem on your farm, search out and kill these bushes and advise your County Weed Inspector or Agricultural Representative so that adjacent areas can be checked. Consult Publication 49, **Rid Ontario of Common Barberry and European Buckthorn**.

SEED TREATMENT*. The following diseases in cereal crops can be controlled by seed treatments.

COVERED SMUT and SEEDLING BLIGHT in barley

* See Ontario Department of Agriculture and Food Publication 252, *Chemicals for Seed Treatment of Small Grains*, for trade names of chemicals, and Publication 524, *Smut Diseases of Grain Crops*, for details of treatment.

COMMON BUNT, FUSARIUM BLIGHT and SEEDLING BLIGHT in wheat

COVERED SMUT and LOOSE SMUT in oats
SEEDLING BLIGHT in rye

All cereal seed should be cleaned and treated with a seed dressing. See Page 54 for precautions to take when preparing and using seed dressings.

ORGANIC MERCURY SEED DRESSINGS. Cereal seed treated with organic mercury fungicides may be used for spring planting in 1971. There may be new regulations limiting the use of mercury fungicides for treating cereal seed to be planted in the fall of 1971. Extreme precautions must be taken to prevent animals from accidentally eating treated seed grain. Consult Page 54 about the dangers of mercurial and other seed treatments and precautions to take when preparing and using them.

NON-MERCURIAL SEED DRESSINGS. Non-mercurial seed dressings are also available, primarily as drill-box formulations. Treat seed with one of:

Agrox N-M

Green Cross Res Q

Polyram

Vitavax (not effective for seedling blights)

The following diseases may be controlled by the treatments indicated.

LOOSE SMUT in barley and wheat. Sow registered seed (which has a low smut count by embryo test) of a resistant variety, and treat seed with Vitavax at 4 oz per 100 lb seed. Vitavax also controls loose smut in susceptible varieties if properly applied.

The anaerobic treatment will also reduce loose smut infestation in seed. Directions for an anaerobic treatment: soak the seed in water for two hours at approximately 76°F. After soaking, drain off water and place seed in a closed container (milk can or plastic bag) for 65 hours at 76° to 80°F. It is essential that these temperature limits be observed. After treatment, spread out the seeds in a thin layer to dry enough to run through a drill. Treated seed can be kept for several weeks, provided it is dried thoroughly.

COMMON BUNT in wheat can be controlled also by treating seed with hexachlorobenzene seed dressing. This is less hazardous to apply under farm conditions than a mercury preparation.

DWARF BUNT in wheat, where it is seed-borne, can be controlled by treating seed with Vitavax. There is a possibility that Vitavax is effective also against soil-borne dwarf bunt.

INSECTS

WIREWORMS damage cereal crops in certain areas every year. Injury is usually most severe in the two years following grass sod. As a precautionary measure, treat all grain seed with 50% lindane wettable powder, at one ounce per bushel in combination with an organic mercurial or non-mercurial fungicide according to directions on the label. Add the correct amount of fungicide and insecticide to one-half pint of water for each bushel to be treated. When treating, pour the water in slowly while mixing and do a thorough job of wetting all of the seed. Commercial seed treatment gives thorough coverage, but mixing can also be done in a cement mixer or by thorough hand shovelling. The dry powder can be mixed with the seed but this may result in inadequate coverage. Drill-box formulations are available.

Consult Page 54 about the dangers and precautions to follow when preparing and using mercurial and other seed treatments.

ARMYWORMS. Apply a spray at time of outbreak.

Insecticide Formulation**	Rate/acre
carbaryl (Sevin) 50% WP	2 lb
80 to 85% WP	1¼ lb
malathion 25% WP	6 lb
50% EC (5 lb per gal)	1¼ qt
Methoxychlor 50% WP	3 lb
24% EC	2½ qt
*parathion 15% WP	2 lb

*Observe extreme safety precautions

**EC—Emulsifiable Concentrate; WP—Wettable Powder

CEREAL LEAF BEETLE. The presence of this insect in much of southwestern Ontario has made necessary the enforcement of certain regulations to prevent the spread of this pest. Growers contemplating the sale of small grains, shelled or ear corn, hay and straw, to buyers north of a line between Sault Ste. Marie and Mattawa should inquire at an office of the Plant Protection Division (Canada Department of Agriculture) in Windsor, London, Niagara Falls, Guelph, Toronto or Ottawa.

Watch for and report damage by this insect in oats, wheat and barley to your Agricultural Representative or Soils and Crops Specialist.



CHEMICAL WEED CONTROL IN GRAINS

Always read and follow the instructions which the manufacturer has printed on the herbicide label. This will give you further information on how to apply the chemical and on conditions which will affect results. This can save you money and help prevent crop damage.

Wheat, Oats, Barley	Weed Situation	Chemical	Rate per Acre Active Ingredient	Remarks
Not Under- seeded to Forage Crops	Broadleaf weeds such as mustard, lamb's- quarters, ragweed, pigweed	2,4-D (Amine)	Not over 8 oz	Apply the treatment when the crop is in the 2- to 5-leaf stage of growth. Early treatment is preferable. Treat winter wheat and winter barley in the spring. Oats are less susceptible to injury from MCPA than 2,4-D and MCPA may be used safely at an earlier stage of growth.
		MCPA (Amine)	Not over 12 oz	
	Many broadleaf weeds including smartweed and wild buckwheat	Bromoxynil	6 oz	Since Bromoxynil moves very little within the plant, it is necessary to cover the weeds thoroughly with the spray. At least 20 gal water per acre should be used when the weeds are in the 4-leaf stage or partly covered by the cereal leaves. Bromoxynil should not be used after the 5-leaf stage of cereal development.
	Many broadleaf weeds including wild buck- wheat	Dichloroprop + 2,4-D	16 oz	Apply to emerged weeds when the cereals are in the 3- to 5-leaf stage of growth. For wheat and barley only. Sold as Estaprop , a 1:1 mixture of Dichloroprop and 2,4-D .
	Many broadleaf weeds including smartweed, field bindweed, Canada thistle, perennial sow thistle	Commercial mixture of Dicamba 2,4-D Mecoprop	Not over 8 oz (total acids)	Sold as Banvel 3 or Kil-Mor . For oats or wheat apply not more than 8 oz (total acids per acre) when the crop is in the 3- to 5-leaf stage of growth. Use not more than 6 oz (total acids per acre) when barley is in the 2- to 3-leaf stage of growth. Not registered for use on winter wheat, winter barley or malting barley.
	Canada thistle and perennial sow thistle	2,4-DB	16 to 20 oz	Treat the crop at the 2- to 5-leaf stage of growth when the weeds are fully emerged and before flowering. Many other broadleaf weeds will be controlled. The mixture of MCPB and MCPA (15:1) should be used where common mustard is a problem. 2,4-DB will kill mustard only if applied before the mustard is taller than 2 inches. These herbicides should be applied in 15 to 20 gal water per acre.
		MCPB-MCPA (15:1 mixture)	16 to 20 oz	

Not Under-seeded to Forage Crops	Wild oats in spring, barley and spring wheat	Barban (Carbyne)	4 to 6 oz	Barban should be applied when the majority of the wild oats are in the 2-leaf stage. Use at least 50 psi, and 4 to 10 gal water per acre.	
				Triallate (Avadex BW)	1½ lb
				Triallate must be worked into the soil to kill wild oats. This incorporation can be accomplished with a disk or harrow before planting or with a harrow after planting and should be done within 2 hours after application of the chemical.	
	Quack grass, milkweed, and Canada thistle	Amitrole T	1.5 gal (product)	Apply after harvest to actively growing quack grass, milkweed, or Canada thistle foliage. Wait at least 10 days before working the area.	
	Quack grass	Dalapon	10 to 15 lb (product)	Apply in the fall to actively growing foliage. Wait at least 3 days before working the area.	

PEAS AND FIELD BEANS

(See Heat Unit Map on Page 6)

FIELD PEAS

Variety Recommendations

CENTURY }
CHANCELLOR } —Areas north of the 2900-heat-unit line.

CHANCELLOR — Small, smooth, yellow peas of good quality for soup or protein supplement for feeding. Flowers white, mature midseason.

CENTURY — Seed medium size, smooth and rounded, yellow, used for soup either whole or split. Flowers white, matures midseason (same as Chancellor).

FIELD BEANS

Variety and Planting Date Recommendations

	2600-2900 heat units	2900-3100 heat units	3100 or more heat units
Seaway	June 1-10	June 5-15	June 15-25
Seafarer	June 1-10	June 5-15	June 15-25
Sanilac	June 1-5	June 5-10	June 10-20

Choose a variety that will mature every year in your heat unit area.

Field Bean Variety Descriptions

	Plant Type	Yield* cwt/acre @ 18% Moisture	Days To* Maturity	Reaction To Disease**	
				Mosaic	Anthrachnose
Seaway	Bush	20.0	92	R	S
Seafarer	Bush	19.9	91	R	R
Sanilac	Bush	20.8	95	MR	R

*Yields and maturity figures were obtained by averaging 12 tests from 1968-70 that were conducted by Harrow Research Station, Ridgely College of Agricultural Technology, and Kemptville College of Agricultural Technology.

**S = Susceptible; R = Resistant; MR = Moderately Resistant

Row widths of 24 to 28 inches are standard because of the nature of the harvesting equipment. **Plant 5 or 6 seeds** per foot of row (35 to 40 lb) in 28-inch rows or the equivalent seeding rate in 24-inch rows for best results with a minimum of disease problems.

Steuben is a yellow eye bean variety that is adapted to areas of 3100 heat units or more. It is a bush type and is susceptible to the common strains of bean mosaic and anthracnose.

Fertilizers for Field Peas and Beans

Fertilizer needs of the pea and bean crops should be determined from a soil test. The following general fertilizer recommendations should be followed only when a soil test report is not available.

Pea and bean seedlings are easily damaged by direct contact with fertilizer. The fertilizer may be broadcast and plowed down or worked in before planting, or a planter with a separate shoe for fertilizer placement may be used to place the fertilizer 2 inches to the side and 2 inches below the seed.

■ On sandy or loamy soils use 15 lb N, 60 lb P₂O₅, 60 lb K₂O per acre, e.g. 6-24-24 (a 1-4-4 ratio), at 250 lb per acre.

■ On clay soils use 15 lb N, 60 lb P₂O₅, 30 lb K₂O per acre, e.g. 8-32-16 (a 1-4-2 ratio), at 200 lb per acre.

■ Where manure is applied reduce the total fertilizer application by one-third. After a legume sod use 0-20-20 (a 0-1-1 ratio) on sandy and loamy soils, and 0-20-10 (a 0-2-1 ratio) on clay soils at 300 lb per acre.

Disease and Insect Control in Field Beans

(See also Pages 54 to 55)

SEED TREATMENTS containing diazinon, lindane and a fungicide are required to protect large seeded crops from **SEED MAGGOTS**, **WIREWORMS** and **SEED-DECAY ORGANISMS**.

APPLICATION OF THE INSECTICIDES ALONE MAY RESULT IN REDUCED GERMINATION. Diazinon is used to control seed maggots; lindane to control wireworms. The combination seed treatment should be applied every year because maggots are usually an annual pest and the kill of the wireworm seldom is high.

Because of changes in pesticide regulations all seed will have to be treated for root maggot, wireworm and seed-decay control. If your local dealer does not treat, use a planter-box formulation, and dry-treat the seed when planting. These combinations of diazinon and lindane are available from seed suppliers in individual containers for one bushel lots of seed. Directions stated on the container should be followed with care; the mixing in the planter box must be thorough or germination will be reduced and insect control will be poor. For your protection while mixing, use rubber gloves and a wooden paddle and avoid breathing dust stirred up while the mixing is in progress.

DISEASES

ANTHRACNOSE and **BACTERIAL BLIGHT** are persistent diseases against which a continual fight must be waged. To keep them from building up, follow a 2- to 5-year rotation; do not apply manure containing bean refuse to land intended for beans; do not plant seed which has been harvested from diseased plants; and stay out of fields when foliage is wet.

WHITE MOLD (Sclerotinia) usually occurs after August 15 in fields where dew never completely evaporates from plants. This is caused by poor air circulation. Where the disease is a problem, use bush-type varieties and reduced seeding rates (never more than 5 to 6 seeds per planted foot). The fungus is widespread and crop rotation may not give much control.

INSECTS

MEXICAN BEAN BEETLES and **POTATO LEAF-**

HOPPERS cause severe damage some years. Growers should treat their plants when insects appear. Two or at the most three treatments will be adequate.

The following treatments will control both insects.

Insecticide	Formulation	Rate per Acre
carbaryl (Sevin)	50% WP	1 to 2 lb*
	80 or 85% WP	¾ to 1-1/5 lb*
azinphos-methyl (Guthion)	EC	1-2/3 pts
**endosulfan (Thiodan)	4EC	1 pt
**dimethoate		
Cygon	4E	½ to ¾ pt
Rogor	40%	
malathion	25% WP	4 lb

*Use lower rate for Mexican Bean Beetle

**Do not use stover for feed or bedding

Granular Treatment at planting time for both insects: disulfoton (Di-Syston) 15% granular, 7 lb; phorate (Thimet) 10% granular, 10 lb. Application must be at least 60 days before harvest.

GREEN CLOVERWORM appears some years as green worms (loopers) feeding on bean foliage, causing holes in leaves and reducing yield. Shake worms from plants onto paper to count them. If more than five caterpillars are found per foot of row, spray with one of:

Insecticide	Formulation	Rate per Acre
carbaryl (Sevin)	80 or 85% WP	1¼ lb
*azinphos-methyl (Guthion)	50% WP	1 lb
	EC	1½ pt

*30-day waiting period to harvest. Do not use stover for feed or bedding.

CHEMICAL WEED CONTROL IN FIELD BEANS

Always read and follow the instructions which the manufacturer has printed on the herbicide label. This will give you further information on how to apply the chemical and on conditions which will affect results. This can save you money and help prevent crop damage.

Weed Situation	Chemical	Rate per Acre Active Ingredient	Applied as	Remarks
Germinating common annual broadleaf weeds*	Metobromuron (Patoran)	1 to 1½ lb	Preemergence	Use the lower rate on light-textured soils. Do not use on sandy soils of less than 2% organic matter. Sow beans at least 1½ inches deep. Rotary hoe if dry weather follows the application.
Germinating annual grasses, nut sedge	EPTC (EPTAM)	2 to 3 lb	Preplant-incorporated	EPTC (EPTAM) should be applied to a dry soil surface before planting and incorporated within 10 minutes with a double disk set to a depth of 4 inches or a Triple K type cultivator (vibrating cultivation). A second disking should be done at right angles in tandem with a harrow. Use 2 to 3 lb on sandy soils and 3 lb on clay soils. If dry weather has preceded the application of EPTC, delay seeding 7 to 10 days. Application to a moist soil surface has been ineffective. Temporary injury can occur in the emerging crop.
Germinating annual grasses	Trifluralin (Treflan)	½ to 1 lb	Preplant-incorporated	Treflan must be applied before planting and incorporated immediately with a double disk and harrow in tandem. Disking should be done to a depth of 4 inches in two directions at right angles to one another. Use the higher rate on clay soil and the lower rate on sand. Black nightshade and ragweed are not controlled and mustard and smartweed may escape.
Germinating annual broadleaf weeds and grasses	Chloramben (Amiben) Trifluralin (Treflan) + Metobromuron (Patoran)	2 lb (sandy soils) or 3 lb (clay soils) ½ to 1 lb + ¾ to 1 lb	Preemergence Preplant-incorporated + Preemergence	Controls most annual broadleaf weeds and grasses with the exception of mustards. Weed control will last for at least 8 weeks. Delayed maturity may occur if heavy rainfall follows application. Rotary hoe if dry weather follows the application. See above for each chemical.
Quack grass	EPTC (EPTAM) + Metobromuron (Patoran) Amitrole T	2 to 3 lb + ¾ to 1 lb 2 to 3 lb	Preplant-incorporated + Preemergence Before planting	See above for each chemical. Apply in the fall or spring to actively growing quack beans on grow- grass foliage. Wait 10 to 14 days before plowing or disking; beans can then be planted. Row cultivation may be required.

*Common annual broadleaf weeds include ragweed, pigweed, lamb's-quarters, and mustards. (See exceptions listed under remarks.)

FIELD BEAN HERBICIDE WEED CONTROL RATINGS

This chart is intended to help in the selection of a herbicide to control specific weeds. For complete information refer to remarks given for each chemical on the preceding pages.

The chemical ratings in this chart give general comparisons based on use as described in this publication. In unfavorable conditions (e.g. too dry, too wet, too cold, and poor spray job) the herbicides may not be as effective as shown in the chart.

Weed Control Rating E — excellent G — good F — fair P — poor	ANNUAL BROADLEAVES								ANNUAL GRASSES					PERENNIALS							BEAN TOLERANCE
	buckwheat, wild	lady's-thumb	lamb's-quarters	mustards	nightshade, black	pigweeds	ragweeds	velvetleaf	barnyard grass	crab grass	fall panicum	foxtail	old witch grass	bindweed, field	horsetail	milkweed	nut sedge	quack grass	sow thistle	thistle, Canada	
ACTIVE CHEMICAL PER ACRE																					
PREPLANT Amitrole (Amitrole T, Cytrol) 2-3 lb	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	G	E	G	G
PREPLANT INCORP. EPTC (EPTAM) 2-3 lb	F	F	G	P	F	F	F	F	E	E	E	E	E	P	F	P	E	P	P	P	E
Trifluralin (Treflan) ½-1 lb	F	F	F	P	P	F	P	P	E	E	G	E	E	P	P	P	P	P	P	P	E
SPLIT APPLICATION Trifluralin (Treflan) ½-1 lb + Meto- bromuron (Patoran) ¾-1 lb	E	E	E	E	G	E	E	F	E	E	G	E	E	P	P	P	P	P	P	P	G
EPTC (Eptam) 2-3 lb + Metobromuron (Patoran) ¾-1 lb	E	E	E	E	G	E	E	F	E	E	G	E	E	P	F	P	E	P	P	P	G
PREEMERGENCE Chloramben (Amiben) 2-3 lb	G	G	G	F	F	E	G	F	G	F	P	F	G	P	P	P	P	P	P	P	F
Metobromuron (Patoran) 1-1½ lb	E	E	E	E	G	E	E	F	F	F	F	G	G	P	P	P	P	P	P	P	G

*Amitrole cannot be used effectively to control these weeds in the field bean crop, but it may be used to control all weeds after harvest.

SOYBEANS

Variety Recommendations

Choose a variety that will mature every year in your locality.

When you intend to sow fall wheat following a soybean crop, choose a variety that requires 300 heat units less than those available in your area.

Variety	Heat Units* Required	Recommended Row Width
ALTONA	2500	28" OR LESS
MERIT	2600	28" OR LESS
HARDOME	2700	28" OR LESS
CHIPPEWA 64	2800	28" OR LESS
HAROSOY 63	3100	28" OR LESS
BEESON	3200	28" OR LESS

*See heat unit map, Page 6.

Variety Descriptions

Variety	Heat Units Required	Color			Seeds/ Pound	Reaction to Phytophthora Root Rot*
		Flower	Pubescence	Hilum		
Altona	2450	Purple	Brown	Black	2400	R
Merit	2650	White	Gray	Buff	3000	R
Hardome	2700	Purple	Gray	Gray	2700	S
Chippewa 64	2800	Purple	Brown	Black	2900	R
Harosoy 63	3100	Purple	Gray	Yellow	2600	R
Beeson	3200	Purple	Gray	Brown-Black	2500	R

*R = Resistant; S = Susceptible

AGRONOMIC DATA 2500 — 2900 HEAT UNIT AREA

Three-year average of 10 trials located in Ottawa, Kemptville, Smithfield, and Elora

Variety	Heat Unit Rating	Yield Bushels/Acre 14% Moisture	Days From Planting To Maturity	Plant Height Inches	Lodging 1 = None 5 = All
Altona	2450	38	117	32	2.2
Merit	2650	41	126	37	2.3
Hardome	2700	40	129	40	3.1

AGRONOMIC DATA 3000 — 3400 HEAT UNIT AREA

Three-year average of 11 trials located in Ridgetown, Oil Springs, Woodslee, and Harrow

Variety	Heat Unit Rating	Yield Bushel/Acre 14% Moisture	Days From Planting To Maturity	Plant Height Inches	Lodging 1 = None 5 = All
Altona	2450	38	103	31	2.2
Merit	2650	42	110	37	1.8
Hardome	2700	42	111	40	2.8
Chippewa 64	2800	41	115	38	2.0
Harosoy 63	3100	46	122	45	2.8
Beeson	3200	49	125	42	2.6

Planting Recommendations

Make allowance for variety seed size difference. One bushel (60 pounds) per acre seeding rate is adequate for most varieties in 14- to 28-inch rows. Adjust seeding rate upward for lower germination or for soils which crust

badly. Uniform depth of seeding at 1 to 2 inches is important. Soybeans should be planted the last 10 days of May (May 20 - May 30).

Row Width	Lb/Acre	Seed Drop per Foot of Row (2,400 seeds/lb — 3,000 seeds/lb)
28	60	8 - 10
21	60	6 - 8
14	60	4 - 5

Fertilizers for Soybeans

Soybeans will produce highest yields where other crops in the rotation have been well fertilized. Soybeans should be inoculated each time the crop is planted.

Fertilizer needs of the soybean crop should be determined from a soil test. The following general fertilizer recommendations should be followed only when a soil test report is not available.

Bean seedlings are easily damaged by direct contact with fertilizer. The fertilizer may be broadcast and plowed down or worked in before planting, or a planter with a separate shoe for fertilizer placement may be used to place the fertilizer 2 inches to the side and 2 inches below the seed.

On sandy or loamy soils use 10 lb N, 40 lb P₂O₅, 40 lb K₂O per acre, e.g. 6-24-24 (a 1-4-4 ratio), at 175 lb per acre.

On clay soils use 10 lb N, 40 lb P₂O₅, 20 lb K₂O per acre, e.g. 8-32-16 (a 1-4-2 ratio), at 125 lb per acre.

MANGANESE DEFICIENCY occurs frequently in soybeans. The upper leaves range from pale green (slight deficiency) to almost white (severe deficiency) while the veins remain green.

Correct the deficiency as soon as detected, by spraying with 6 to 8 lb manganese sulfate in 20 or more gallons water per acre. Use a "spreader sticker" (such as Tween 20) in the spray. If the deficiency is severe, a second spray may be beneficial.

Never use spray equipment which has been used for spraying hormone-type herbicides such as 2,4-D. Beans are very sensitive to this type of herbicide.

Disease and Insect Control in Soybeans

(See also Pages 54 to 55)

SEED TREATMENT

See Seed Treatment under Field Beans on Page 43. When planting soybeans in an area for the first time, omit the seed treatment. Seed treatment chemicals may be

too toxic for the inoculant and poor inoculation can result. Poor inoculation cannot be accepted where high yields are being sought.

PLANTING

On clay soils where **PHYTOPHTHORA ROOT ROT** is a problem, and a suitable resistant variety is not avail-

able, deep seedbed preparation by plowing rather than disking will minimize losses due to this disease.

CHEMICAL WEED CONTROL IN SOYBEANS

Always read and follow the instructions which the manufacturer has printed on the herbicide label. This will give you further information on how to apply the chemical and on conditions which will affect results. This can save you money and help prevent crop damage.

Weed Situation	Chemical	Rate per Acre Active Ingredient	Applied As	Remarks
Germinating common broadleaf annual weeds*	Linuron	1 to 2 lb	Preemergence	Preemergence treatments. Controls annual broadleaf weeds with a good margin of safety to the soybeans. Annual grasses may escape, therefore rotary hoeing or cultivation may be necessary. Use lower rates on light-textured soils and the 2-lb rate on clay soils only. Do not use on sandy soils of less than 2% organic matter. Beans should be seeded at least 1½ inches deep.
	Metobromuron (Patoran)	1½ to 2 lb	Preemergence	
Emerged annual broadleaf weeds	Chloroxuron (Tenoran) + Surfactant Adjuvan T	1½ to 2 lb + 1 pt/25 gal water	Early postemergence	Applied early postemergence before weeds reach a height of 1 to 2 inches and after the soybeans have formed true leaves. Will not control grasses. Temporary soybean injury will occur.
Germinating annual grasses	Alachlor (Lasso)	2 to 2½ lb	Preemergence	Preemergence treatment. Controls annual grasses and black nightshade but does not control other annual broadleaf weeds.
Germinating annual grasses, nut sedge	Trifluralin (Treflan)	½ to 1 lb	Preplant Incorporated	Must be applied before planting and incorporated immediately with a double disk and harrow in tandem. Disk at a depth of 4 inches in two directions at right angles to one another. Use high rate on clay soil and lower rate on sand. Black nightshade and ragweed are not controlled and mustard and smartweed may escape.
	Vernolate (Vernam)	2 to 3 lb	Preplant- incorporated	Vernam should be applied to a dry soil surface before planting and incorporated within 10 minutes with a double disk set to a depth of 4 inches or a Triple K type cultivator (vibrating cultivation). A second disk-ing should be done at right angles in tandem with a harrow. Use 2 to 3 lb on sandy soils and 3 lb on clay soils. Temporary injury may occur to the soybeans but yields are not usually affected. Ragweed is not controlled and mustard and smartweed may escape.
Germinating annual broadleaf weeds and grasses	Alachlor (Lasso) + Linuron	2 lb + ¾ to 1 lb	Preemergence tank mix	See above for each chemical.

Alachlor (Lasso) + Metobromuron (Patoran)	2 lb + ¾ to 1 lb	Preemergence tank mix	See above for each chemical.
Chloramben (Amiben) or 3 to 4 lb (clay soils)	2 to 3 lb (sandy soils) or 3 to 4 lb (clay soils)	Preemergence	Controls annual broadleaf weeds and grasses with an excellent margin of safety to the soybeans. Weeds with the exception of mustards will be controlled for at least eight weeks after application.
Linuron + Propachlor (Ramrod)	1 to 1½ lb + 2 to 3 lb	Preemergence as commercial formulated mixture	Preemergence in bands with row cultivation necessary to control weeds between rows. Sold as Londax, a commercial granular or wettable powder formulation. Effective on high organic matter soils.
Trifluralin (Treflan) + Linuron	½ to 1 lb + ¾ to 1 lb	Preplant- incorporated + Preemergence	See above for each chemical.
Trifluralin (Treflan) + Metobromuron (Patoran)	½ to 1 lb + ¾ to 1 lb	Preplant- incorporated + Preemergence	See above for each chemical.
Trifluralin (Treflan) + Chloroxuron (Tenoram) with surfactant	½ to 1 lb + 1½ to 2 lb	Preplant- incorporated + Postemergence	See above for each chemical.
Quack grass Amitrole T	2 to 3 lb	Before planting beans on growing quack grass	Apply in the fall or spring to actively growing quack grass foliage. Wait 10 to 14 days before plowing or disking. Beans can then be planted. Row cultivation may be required.

*Common annual broadleaf weeds include ragweed, pigweed, lamb's-quarters, and mustards. (See exceptions listed under remarks.)

SOYBEAN HERBICIDE WEED CONTROL RATINGS

This chart is intended to help in the selection of a herbicide to control specific weeds. For complete information refer to remarks given for each chemical on the preceding pages.

The chemical ratings in this chart give general comparisons based on use as described in this publication. In unfavorable conditions (e.g. too dry, too wet, too cold, and poor spray job) the herbicides may not be as effective as shown in the chart.

Weed Control Rating E — excellent G — good F — fair P — poor	ANNUAL BROADLEAVES								ANNUAL GRASSES					PERENNIALS							
	buckwheat, wild	lady's-thumb	lamb's-quarters	mustards	nightshade, black	pigweeds	ragweeds	velvetleaf	barnyard grass	crab grass	fall panicum	foxtail	old witchgrass	bindweed, field	horsetail	milkweed	nut sedge	quack grass	sow thistle	thistle, Canada	Soybean Tolerance
ACTIVE CHEMICAL PER ACRE																					
PREPLANT Amitrole (Amitrole T) 2-3 lb	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	G	E	G	G
PREPLANT INCORP. Trifluralin (Treflan) ½-1 lb	F	F	F	P	P	F	P	P	E	E	G	E	E	P	P	P	P	P	P	P	E
Vernolate (Vernam) 2-3 lb	F	F	F	P	P	F	F	P	G	E	G	E	G	P	F	P	F	P	P	P	G
PREEMERGENCE Alachlor (Lasso) 2 lb	P	P	F	P	G	G	P	P	E	E	E	E	E	P	P	P	P	P	P	P	G
Chloramben (Amiben) 2-3 lb	E	E	E	F	F	E	G	F	G	G	F	G	G	P	P	P	P	P	P	P	E
Linuron (Afalon, Lorox) 1-2 lb	E	E	E	E	G	E	E	F	F	F	F	F	F	P	P	P	P	P	P	P	G
Metobromuron (Patoran) 1-2 lb	E	E	E	E	G	E	E	F	F	F	F	F	F	P	P	P	P	P	P	P	G
Linuron 1-1½ lb + Propachlor (Ramrod) 2-3 lb	E	E	E	E	G	E	E	F	E	E	E	E	E	P	P	P	P	P	P	P	G
Alachlor (Lasso) 2 lb + Metobromuron (Patoran) ¾-1 lb	E	E	E	E	G	E	E	F	E	E	E	E	E	P	P	P	P	P	P	P	G
Alachlor (Lasso) 2 lb + Linuron (Lorox, Afalon) ¾-1 lb	E	E	E	E	G	E	E	F	E	E	E	E	E	P	P	P	P	P	P	P	G
SPLIT APPLICATION Trifluralin (Treflan) ½-1 lb + Meto- bromuron (Patoran) ¾-1 lb	E	E	E	E	G	E	E	F	E	E	G	E	E	P	P	P	P	P	P	P	G
Trifluralin (Treflan) ½-1 lb + Linuron (Lorox, Afalon) ¾-1 lb	E	E	E	E	G	E	E	F	E	E	G	E	E	P	P	P	P	P	P	P	G
SOYBEANS & WEEDS UP Chloroxuron (Tenoran) 1½-2 lb + Adjuvan-T	G	G	G	G	G	G	G	G	P	P	P	P	P	P	P	P	P	P	P	P	F

*Amitrole cannot be used effectively to control these weeds in the soybean crop, but it may be used to control all weeds after harvest.

GENERAL INFORMATION FOR CROP PRODUCTION

Soil Management And Fertilizer Use

Ontario currently uses more than 800,000 tons of commercial fertilizers annually and use continues to increase. Fertilizers are an integral part of crop production and in theory they could serve as the only source of nutrients for plants. In actual practice high yields can be produced efficiently only when fertilizer use is related to the fertility level of the soil and to other additions of nutrients in manure, crop residues, sewage sludge, etc. At one extreme, on very low fertility soils, it is occasionally profitable to add as much nitrogen, phosphorus or potassium in the fertilizer as a crop removes. At the other extreme, on high fertility soils or following heavy application of manures, commercial fertilizer may not be profitable, and occasionally may reduce yields.

Specific fertilizer needs of field crops are best determined by a soil test and growers are strongly advised to take advantage of this service. The general recommendations for fertilizer applications which appear in this publication are intended only as a guide when soil tests are not available.

Fertilizers do not eliminate the need for good soil management to maintain soil organic matter, tilth and aeration. Organic matter serves as a storehouse which releases plant nutrients slowly throughout the growing

season and also helps to maintain a suitable physical soil condition for root growth.

Soils are often grouped into sandy (coarse-textured) soils and clay (fine-textured) soils for purposes of fertilizer recommendations. Generally more nitrogen and potassium fertilizer is needed to maintain high levels of fertility in a sandy soil than in clay.

Manure

Manure is a valuable waste resource on Ontario livestock farms that should be used in crop production programs. The return of animal manures to the soil provides both biological and chemical benefits.

Manure should be used to supply some of the necessary plant food for crop production and can substitute for commercial fertilizers.

The largest portion of the plant food in animal feed (50 to 70% of the nitrogen, 70% of the phosphorus, and 85% of the potassium content) is excreted in manure.

The following table provides a guide to the plant food content of manure that is of direct benefit in the first crop year. An additional benefit to the soil is the portion of the plant food in manure that becomes available to succeeding crops.

Average Plant Food Content in Manure Available in First Crop Year

Source	Solid Tons/Acre*	Liquid Gallons/Acre	Direct Crop Benefit (lb/Acre)		
			N	P ₂ O ₅	K ₂ O
Pig, Beef, Dairy	15	6,000	75	30	90
Poultry	5	3,000	75	45	45

* 60 bushels per ton

FERTILIZER MATERIALS

Nitrogen fertilizer materials are available in dry or liquid forms. Which of these forms to use is a matter of choice for the individual farmer depending upon availability of the material, equipment for handling, and cost per pound of nitrogen, plus the cost of application.

A farmer should first calculate the cost per pound of nitrogen from various sources delivered to his farm. Depending on the rate of application, the cost per acre can be determined. Add to this the cost of application per acre before deciding on the nitrogen source to use.

Where separate additions of nitrogen are referred to in the recommendations, pounds of elemental nitrogen (N), not pounds of materials, are used. The following tables show the percentage of fertilizer nutrient contained in different materials.

<u>Nitrogen Materials</u>		<u>% Nitrogen (N)*</u>
Ammonium nitrate	Dry	33-34
Urea	Dry	45
Ammonium Sulfate	Dry	20
Aqua Ammonium	Liquid	20
Ammonium Nitrate-Urea	Liquid	28
Ammonium Nitrate-Urea	Liquid	32
Ammonia-Ammonium Nitrate-Urea	Liquid	41
Ammonium Nitrate-Ammonia	Liquid	38
Anhydrous Ammonia	Liquid	82

<u>Phosphate Materials</u>		<u>% Phosphate (P₂O₅)*</u>
Superphosphate		20
Treble Superphosphate		46
Ammonium Phosphate (13-52-0)		52
Diammonium Phosphate (18-46-0)		46

<u>Potash Materials</u>		<u>%Potash (K₂O)*</u>
Muriate of Potash		60
Sulfate of Potash		48
Sulfate of Potash-Magnesia (18% MgO)		22

* Pounds of N, P₂O₅, or K₂O supplied in 100 lb of material.

SOIL TESTING

A soil test is the basis for a sound soil fertility program on Ontario farms.

Every effort should be made by the farmer to sample the soil from his fields at regular intervals (every two to three years) in order to maintain or increase his production and to obtain information on the most profitable use of commercial fertilizers.

Fertilizer recommendations based on soil test results are made by Agricultural Representatives, Fruit and Vegetable Specialists, and Soil and Crop Specialists, in County and District offices. Soil sample boxes and field information sheets are available from these offices. Management practices which affect a soil test recommendation are: manure application, straw or cornstalks plowed down, the kind of crop to be plowed down, and the crop to be fertilized. **This information is important and should be recorded on the field information sheet which must accompany the soil sample sent in for analysis, before reliable fertilizer recommendations can be made.**

The results of soil tests are forwarded to the County and District offices within two weeks of receipt of samples in the laboratory. However, to allow time for mailing and analysis, **soil samples from fields to be fertilized for spring crops should be taken the previous fall.**

Soil samples from fields to be fertilized for fall wheat or from hay and pasture fields to be fertilized in the fall should be taken in the spring or early summer.

Mail or express samples to the Department of Soil Science, Ontario Agricultural College, University of Guelph, Guelph, Ontario, where the soil analysis will be completed.

The soil test can:

- (1) indicate the kind and amount of lime required;
- (2) measure the soil nutrients available for crop production;
- (3) provide the basis for suggested rates of fertilizer application.

Fertilizers applied on the basis of soil test results do not remove the limitations placed on crop production by poor soil drainage, by adverse weather conditions such as moisture and temperature, by inadequate plant populations or poor choice of variety, by poor weed control programs or by insect damage.

Alternative Methods of Supplying Fertilizer Requirements

The general recommendations for nitrogen, phosphorus, and potassium given for each crop can be applied using (1) mixed fertilizers or (2) mixed fertilizers and fertilizer materials or (3) fertilizer materials alone.

Below are examples of three possible ways of supplying the fertility requirements.

Suggested Alternative Methods of Supplying Fertilizer Required (lb per acre)

Crop	Crop Requirements			Mixed Fertilizers (1)	Mixed Fertilizers and Materials (2)	Materials (3)
	N	P ₂ O ₅	K ₂ O			
Corn	100	60	60	6-24-24 @ 250 lb side band 85 lb N*	(A) 8-32-16 @ 100 lb side band 90 lb N* 30 lb P ₂ O ₅ plus 45 lb K ₂ O plowed down OR (B) 8-25-3 (liquid) or 6-24-6 (dry) @ 50 lb with seed 95 lb N* 50 lb P ₂ O ₅ plus 60 lb K ₂ O plowed down	13-52-0 @ 120 lb side band 85 lb N* 60 lb K ₂ O plowed down
Hay-Pasture (mainly grass)	50	60	60	15-15-15 @ 400 lb broadcast in spring	0-20-20 @ 300 lb broadcast in fall or spring 50 lb N broadcast in spring	60 lb P ₂ O ₅ plus 60 lb K ₂ O broadcast in fall or spring 50 lb N broadcast in spring
Spring Grains	40	50	50		6-24-24 @ 200 lb drilled 30 lb N broadcast in spring and worked in	13-52-0 @ 100 lb drilled 50 lb K ₂ O broadcast in fall or spring 30 lb N broadcast in spring and worked in
Spring Grains (seeded down)	15	60	180	8-32-16 @ 200 lb drilled 150 lb K ₂ O broadcast in fall (after grain harvest)		

* Nitrogen may be applied in the spring either as a preplant application (broadcast on the surface and worked in, plowed down, injected) or side-dressed.

Similar alternatives are possible for other crops not listed in the above examples.

USE OF PESTICIDES

Different companies' brands of a pesticide often have different concentrations of the same chemical in them. Consequently, if you use one with a concentration different from that listed in the recommendations in this publication, you will need to adjust the rate of application so that you will be applying the same amount of actual chemical (active ingredient).

Calibrate your sprayer (Page 55) at least twice during the growing season. The wear on nozzle and other parts will alter the amount of spray delivered at the usual rate of speed and pressure.

SAFETY OF OPERATOR

1. Read the safety precautions on the label before using any pesticide. Follow them. Understand the directions given before proceeding. If the label calls for the use of protective clothing or equipment, do not proceed without it.
2. When opening containers and filling the sprayer, avoid splashing or spilling. If it occurs, clean pesticide up promptly and burn any rags or papers used in soaking it up. Do not breathe the dust of dry pesticides. In case of a spill on the operator's person, remove clothing from affected area and wash at once.
3. Pesticides should be mixed or prepared in the open air or in a well-ventilated room. Measure the ingredients accurately and mix them thoroughly before applying. **Do not** smoke, eat, or drink while mixing or applying pesticides.
4. Do not work in spray drift, dust, or fumes. Avoid downwind spraying.
5. Wash contaminated clothing before wearing it again.
6. After applying an insecticide, the operator should bathe and change into clean clothing.
7. Treat all pesticides (insecticides, herbicides, fungicides) as highly poisonous substances and handle them with great caution.
8. Excess pesticide solution should be poured out in an isolated area where it will not contaminate crops or water, or injure domestic animals or wildlife.

SEED TREATMENTS

Seed dressings or treatments are poisonous to man and livestock. Do not inhale the fumes or dust when treating or handling treated seed. Wash all residues of these chemicals from the skin after seed treatment is completed. Never feed surplus seed treated with chemical seed dressings. Bags which have held treated seed must not be used for foodstuffs or feed.

PROTECT HONEYBEES

Because bees may be killed, do not apply insecticides on bee pastures or on wild plants that are in bloom. Carbaryl (Sevin) is extremely toxic to honeybees. If insect control is necessary while crops are in bloom and attractive to honeybees, spray only in the evening or in the early morning when bees are not in the field. Do not spray when the wind will carry the insecticide to adjacent bee pastures.

PESTICIDE APPLICATION BY AIRPLANES OR HELICOPTERS

Applications should not be made if the wind is blowing. Some drift occurs even on the stillest day and to keep it to a minimum, apply pesticides in the evening or early morning. A special permit for aircraft application is required by the Ontario Department of Health, for most organo-phosphorus insecticides. Malathion, dimethoate, and diazinon are exempt, however. Be sure that the product to be used is registered for application by aircraft and specified along with rate of application in the contract. Carbaryl (Sevin) should not be applied by air because of drift to bee foraging areas.

IN CASE OF ACCIDENT INVOLVING A PESTICIDE

If a pesticide is swallowed or if a person suddenly feels sick while using a pesticide, call a physician immediately. So that he will know what poison may be involved, give the physician a label from the container or the common or chemical names of the ingredients listed on the label, together with the suggested antidote, if any, and first aid treatment. Keep the telephone number of your own physician by the telephone.

Information regarding first aid and advice on treatment in cases of pesticide poisoning is available from Dr. E. Mastromatteo, Environmental Health Services Branch, Ontario Department of Health, 1 St. Clair Avenue West, Toronto 195, Ontario.

Telephone: area code 416; office 365-2401; home 485-9606.

RESIDUES ON CROPS TO BE HARVESTED OR FED OR GRAZED

Certain pesticide residues disappear quickly after application; others persist in poisonous form for much longer periods. When crops with persistent residues are fed to livestock, the poisons tend to accumulate in the body fat and milking cows will excrete them, or their metabolic products, in the milk. Young calves, heifers, and dry cows will store these in body fat and secrete them when they freshen months later. Even the use of bedding from treated crop remnants is not recommended.

To avoid residue problems, use (1) the proper chemical, (2) the recommended dosage, and (3) observe the proper interval to harvest.

Never apply endosulfan (Thiodan), chlordane, endrin, BHC (lindane) to forage, hay or other feed that is to be fed to livestock. If hay, corn stover, pea vines, bean straw, etc. are to be purchased, check on the possibility of their having been sprayed. Apple pomace should not be fed because there are residues of insecticides present that may appear in the milk or body fat later.

When using other pesticides, do not apply a treatment closer to pasturing, feeding or harvest than the waiting period indicated below:

azinphos-methyl (Guthion spray concen.) — 3 days	disulfoton (Di-Syston) — 60 days
carbaryl (Sevin) — 1 day	Imidan — 7 days
carbofuran (Furadan) — 14 days	malathion — 7 days
chlordane — 30 days	methoxychlor — 7 days
dimethoate (Cygon 4E, Rogor 40) — 30 days	parathion — 21 days
	phorate (Thimet) — 60 days

CONTAINER DISPOSAL

Empty pesticide containers usually contain harmful residues. Paper and cardboard containers should be burned (keep out of smoke) and the ashes buried under at least two feet of earth in an isolated place, where the residues cannot contaminate water supplies or crops, or injure domestic animals or wildlife. Metal or glass containers should be crushed or broken and buried as described above.

PESTICIDE STORAGE

Pesticides should be stored in their original containers with labels in place — **never in food or beverage containers**. They should be kept in a dry place (wall cupboard, etc) which is kept locked when the products are not being used. Never leave open packages or tins of pesticides around while you are spraying elsewhere.

RELATIVE TOXICITY OF SOME INSECTICIDES

The toxic (poisonous) level indicates the hazard of an insecticide to the user. It is expressed by an LD₅₀ value established for intake through the mouth (oral) and absorption through the skin (dermal). The **LOWER** the figure the **MORE** toxic the material.

Extremely toxic	0 to 20
Highly toxic	20 to 50
Moderately toxic	50 to 500

Wear a respirator and rubber gloves when handling, mixing or applying all insecticides with an LD₅₀ less than 150.

Chemical	Toxicity	
	Oral	Dermal
azinphos-methyl (Guthion)	16	220
Bux	80	400
carbaryl (Sevin)	560	5,000
carbofuran (Furadan)	11	6,000
chlordane	500	1,100
dimethoate (Cygon 4E, Rogor 40)	215	400
disulfoton (Di-Syston)	6	20
Dyfonate	10	130
Imidan	230	3,000
malathion	1,280	4,500
methoxychlor	5,000	6,000
parathion	13	15
phorate (Thimet)	4	5

CAUTION: Always check BOTH the oral and dermal figures to establish the toxicity.

SPRAYERS

Weedicide sprayers, capable of delivering sufficient gallonage per acre for adequate coverage, are satisfactory for applying the emulsion-type of insecticide. However, if 2,4-D or related herbicides have been used in them, such sprayers will have to be cleaned thoroughly or foliage is apt to be damaged (See Publication 256, **Field Weed Sprayers**, Page 36). The detergent recommended should contain ammonia for best results.

For applying the wettable powder formulations, a high-gallonage (40 gallons per acre or more), high-pressure piston pump sprayer with an agitator, is recommended. Keep in mind that the higher the pressure, the greater the danger of drift to other crops.

Determining the Sprayer Output per Acre (Sprayer Calibration)

Here is one method of calibration for both overall spraying and band spraying.

1. Set out two stakes 660 feet apart.
 2. Pick a level spot and fill the sprayer tank with water. Operate the sprayer to be sure that the supply line up to the shut-off valve is full before finally filling the tank. **RECORD THE WATER ON A MEASURING STICK.**
 3. Spray between stakes at a **DEFINITE SPEED AND PUMP PRESSURE.** Turn the boom on as the first stake is passed. The by-pass pressure relief valve must be set to give the desired pressure when the shut-off valve is open. **MARK THE THROTTLE SETTING.**
 4. Return the sprayer to the same location as before the calibration run. Carefully measure the amount of water required to refill the tank to the same mark on the measuring stick.
 5. Calculate the application rate in gallons per acre
- $$\text{GPA} = \frac{\text{Gallons of water added} \times 66}{\text{Boom length (in feet)}}$$

Sample calculation: (1) Overall Sprayer. If the sprayer has a 25-foot-long boom and 12 gallons of water are required to refill the tank, the application rate is:

$$\text{GPA} = \frac{12 \times 66}{25} = 31.7 \text{ gal per acre.}$$

Sample calculation: (2) Band Spraying. If the sprayer has four nozzles and each nozzle covers a 14-inch band, the total width of the spray patterns (boom length) is:

$$4 \times \frac{14}{12} = 4.7 \text{ feet or } 4.7 \text{ feet.}$$

If two gallons of water are required to refill the tank, the application rate is:

$$\text{GPA} = \frac{2 \times 66}{4.7} = 28.1 \text{ gal per acre}$$

NOTE: When band spraying, the acreage actually sprayed is NOT the same as the crop acreage.

Weights, Measures and Seeding Rates

Liquid Measure

20 fluid oz = 1 pint

40 fluid oz = 2 pints = 1 quart

160 fluid oz = 8 pints = 1 imperial gallon

Square Measure

144 sq ins = 1 sq ft

1,296 sq ins = 9 sq ft = 1 sq yd

39,204 sq ins = $272\frac{1}{4}$ sq ft = $30\frac{1}{4}$ sq yds = 1 sq rod

6,272,640 sq ins = 43,560 sq ft = 4,840 sq yds = 160 sq rods = 1 acre

Seeding Rates and Weights Per Bushel

Crop	Weight lb per Bushel	Rate of Seeding per acre	Crop	Weight lb per Bushel	Number Seeds per lb
Wheat	60	$1\frac{1}{2}$ bu	Alfalfa	60	200,000
Oats	34	2 bu not seeded down; $1\frac{1}{2}$ bu if seeded down	Red Clover	60	275,000
Barley	48	2 bu	Ladino	60	800,000
Rye	56	Small-seeded variety $1\frac{1}{2}$ bu; large-seeded $2\frac{1}{2}$ bu	White Dutch Clover	60	800,000
Buckwheat	48	1 bu	Bird's-foot Trefoil	60	425,000
Corn	56	14 lb	Sweet Clover	60	260,000
Beans	60	Small 35 lb	Alsike	60	700,000
Soybeans	60	45 to 70 lb in rows	Timothy	48	1,230,000
Peas	60	$1\frac{1}{2}$ to 3 bu	Orchard Grass	14	654,000
Flax	56	35 lb for seed	Bromegrass	14	136,000
Millet	48	20 lb	Meadow and Tall Fescue ..	22	230,000
Potatoes	60	25 bu	Perennial Rye Grass	20	227,000
Turnips	50	$\frac{1}{2}$ lb	Reed Canary Grass	44	533,000
Mangels		5 lb	Bluegrass	18	2,177,000
Rape & Kale	50	$1\frac{1}{2}$ lb in rows	Sudan Grass	40	55,000

ESTIMATING STORAGE CAPACITY OF FEED VOLUME

Small Grains

To calculate the approximate capacity of a bin in bushels from the measurements of the bin in feet:

Length x Width x Height x 0.8 = bu

Ear Corn in Crib

Length (ft) x Average Width x Average

Depth x 0.4 = bu Shelled Corn.

Space Required to Store One Ton of Hay

	Cubic Feet Per Ton
Loose in shallow mows	500 to 575
Loose in deep mows	400 to 450
Baled loose	250 to 300
Baled tight	150 to 200
Chopped long-cut or shredded	250 to 365
Chopped short-cut	250 to 300

Corn Silage* in Horizontal Silo

Width in Feet		Depth in Feet	Length in Feet	Tons Silage in Silo	Tons Silage per Running Foot in Silo
Top	Bottom				
8	6	6	22	16	.7
10	7	8	27	32	1.2
12	8	8	45	63	1.4
13	9	8	61	95	1.6
14	10	8	75	126	1.6
15	11	8	95	158	1.7
16	12	10	97	236	2.4
17	12	10	124	315	2.5

* These estimates are based on 1 cu ft of corn silage weighing 35 to 50 lb. For grass silage, increase tonnage estimates by 15%.

Volume of Tower Silos at Various Sizes

Inside Diameter of Silo	Volume of Silo				
	Per Ft of Depth	Per 20 Ft of Depth	Per 40 Ft of Depth	Per 60 Ft of Depth	Per 80 Ft of Depth
(ft)	(cu ft)	(cu ft)	(cu ft)	(cu ft)	(cu ft)
10	78.5	1,570	3,140	.....	.....
12	113.1	2,262	4,524	6,786	.....
14	153.9	3,078	6,156	9,234	.....
16	201.0	4,020	9,040	12,060	.....
18	254.5	5,090	10,180	15,270	.....
20	314.2	6,284	12,578	18,852	.....
22	379.9	7,598	15,196	22,794	.....
24	452.2	9,044	18,088	27,132	.....
26	530.7	10,614	21,228	31,842	.....
28	615.4	12,308	24,616	36,924	.....
30	706.5	14,130	28,260	42,390	56,520

Approximate Silo Capacities — Whole Shelled Corn and Ground Ear Corn¹

Moisture in Kernels (%)	Weight to Yield Standard Bushel (²) (lb)	Volume to Yield Standard Bushel (²) (cu ft)	Silo Capacity Per Foot of Height (bu) (²)							
			Inside Silo Diameter (ft)							
			12	14	16	18	20	24	30	
Whole Shelled Corn (²)										
15.5	56.0	1.25	90	123	161	203	251	362	565	
20.0	59.1	1.30	87	119	155	195	241	348	542	
25.0	63.1	1.36	83	113	148	186	231	332	518	
30.0	67.6	1.44	79	107	140	176	218	313	490	
Ground Ear Corn										
15.5	70.0	1.94	58	80	104	131	162	233	363	
20.0	76.5	2.05	55	75	98	124	153	220	343	
25.0	84.4	2.18	52	71	92	116	144	207	323	
30.0	92.1	2.30	49	67	87	110	137	196	307	

(¹) This table of silo capacities was calculated on the basis of data supplied by V. W. Davis, in Publication AE-3997, University of Illinois, March 1964.

(²) For ground shelled corn, increase silo capacity per foot by 14%.

(³) Standard bushel = 1 bu shelled corn at 15.5% moisture. All amounts shown are equivalent to the standard bushel of shelled corn.

SOILS AND CROPS BRANCH SPECIALISTS

Field Crop Specialists

Name	Address	Telephone
W. Napp	O.D.A.F., Essex	519-776-7361
W. W. Parks	R.C.A.T., Ridgetown	519-674-5456
A. K. Brooks	R.C.A.T., Ridgetown	519-674-5456
H. C. Lang	O.D.A.F., Box 398, 478 Huron St., Stratford	519-271-0280
M. C. Watson (Tobacco)	Research Station, Box 820, Delhi	519-582-1950
N. W. Sheidow (Tobacco)	Research Station, Box 820, Delhi	519-582-1950
L. Frayne (Field Crops)	Research Station, Box 820, Delhi	519-582-1950
G. H. Henry	Soil Science Department, University of Guelph, Guelph	519-824-4120 Ext 2454
W. M. Hill	Crop Science Department, University of Guelph, Guelph	519-824-4120 Ext 2513
R. A. Upfold	O.D.A.F., Box 1330, Walkerton	519-881-3301
C. Kingsbury	O.D.A.F., Box 370, Alliston	705-435-5521
J. P. Fish	O.D.A.F., Newmarket Plaza, Newmarket	416-895-4519
H. C. Wright	O.D.A.F., 322 Kent St. W., Lindsay	705-324-6121
D. Bielby	O.D.A.F., 322 Kent St. W., Lindsay	705-324-6121
W. E. Hurst	O.D.A.F., Box 820, Brighton	613-475-1630
A. F. Welbanks	O.D.A.F., Box 651, Kingston	613-546-3697
P. E. Beaudin } J. Schleihau } M. Lareau }	Ontario Government Building, Box 279, Kemptville	613-258-3411

Seeds and Weeds Specialists

G. J. Smith	O.D.A.F., Box 820, Brighton	613-475-1630
W. D. Taylor	Crop Science Department, University of Guelph, Guelph	519-824-4120 Ext 2513
R. D. McLaren	Crop Science Department, University of Guelph, Guelph	519-824-4120 Ext 2513

Insect and Disease Specialist

K. Bereza	Zoology Department, University of Guelph, Guelph	519-824-4120 Ext 2147
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County and District offices of the

ONTARIO DEPARTMENT OF AGRICULTURE AND FOOD

County or District	Address	Telephone
ALGOMA	1496 Wellington St. E., Sault Ste Marie	253-1941
BRANT	207 Greenwich St., Brantford	759-4190
BRUCE	Box 1330, Walkerton	881-3301
CARLETON	26 Thorncliffe Place, Ottawa 6	828-9167
COCHRANE N.	Experimental Farm, Kapuskasing	335-5828
COCHRANE S.	Matheson	32
DUFFERIN	Box 100, Orangeville	941-3830
DUNDAS	Box 488, Winchester	744-2313
DURHAM	14 Frank St., Bowmanville	623-3348
ELGIN	594 Talbot St., St. Thomas	631-4700
ESSEX	Essex	776-7361
FRONTENAC	Box 651, Kingston	546-3697
GLENGARRY	Box 579, Alexandria	525-1046
GRENVILLE	Box 70, Kemptville	258-3411
GREY	181 Toronto St. South, Markdale	986-2040
HALDIMAND	Cayuga	772-3381
HALTON	181 Main St., Milton	878-9701
HASTINGS	Box 340, Stirling	395-3393
HURON	Box 159, Clinton	482-3428
KENORA	70 Van Horne Ave., Dryden	223-2415
KENT	P.O. Box 726, 61½ King St. W., Chatham	354-2150
LAMBTON	Box 730, Petrolia	882-0180
LANARK	Box 460, Perth	267-1063
LEEDS	Box 635, Brockville	342-2124
LENNOX & ADD.	Box 1600, Napanee	354-3371
MANITOULIN	Gore Bay	282-2043
MIDDLESEX	Room 109, County Bldg., 367 Ridout St. N., London 12	434-1613
MUSKOKA & P.S.	Box 130, Huntsville	789-5491
NIAGARA N.	Vineland Station	562-4142
NIAGARA S.	574 South Pelham St., Welland	732-7552
NIPISSING	222 McIntyre St. W., North Bay	474-3050
NORFOLK	19 Kent St. S., Simcoe	426-0680
NORTHUMBERLAND	Box 820, Brighton	475-1630
ONTARIO	Box 309, Uxbridge	852-3132
OXFORD	Box 666, 954 Dundas St. E., Woodstock	537-6621
PEEL	3 Elizabeth St. S., Brampton	451-5474
PERTH	Box 398, 478 Huron St., Stratford	271-0280
PETERBOROUGH	55 George St. N., Peterborough	745-2403
PRESCOTT	Box 110, Plantagenet	673-5111
PRINCE EDWARD	Box 470, Picton	476-3224
RAINY RIVER	Front St., Emo	482-2310
RENFREW	315 Raglan St. S., Renfrew	432-4841
RUSSELL	Box 280, Rockland	762-5106
SIMCOE N.	Box 340, Elmvale	306
SIMCOE S.	Box 370, Alliston	435-5521
STORMONT	Box 655, 109-11th St. W., Cornwall	933-1581
SUDBURY	1414 LaSalle Blvd., Sudbury	566-1630
TEMISKAMING	Box "G", New Liskeard	647-6701
THUNDER BAY	Box 958, Postal Station P, 590 Memorial Ave., Thunder Bay	345-1472
VICTORIA	322 Kent St. W., Lindsay	324-6121
WATERLOO	824 King St. W., Kitchener	744-5294
WELLINGTON	Box 370, Arthur	848-2447
WENTWORTH	R.R. No. 1, Ancaster	527-1744
YORK	Suite 211 & 212, Newmarket Plaza, Newmarket	895-4519

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1971 FIELD CROP RECOMMENDATIONS

Information supplied under the direction of Ontario Committee on Field Crop Recommendations, composed of representatives of the following organizations:

ONTARIO AGRICULTURAL COLLEGE, UNIVERSITY OF GUELPH

ONTARIO DEPARTMENT OF AGRICULTURE AND FOOD

Colleges of Agricultural Technology:

Kemptville

New Liskeard

Ridgetown

Extension Branch

Soils and Crops Branch

CANADA DEPARTMENT OF AGRICULTURE

Research Station, Ottawa

Research Station, Harrow

Experimental Farms, Fort William

Experimental Farms, Kapuskasing

ONTARIO RESEARCH FOUNDATION

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ONTARIO SOYBEAN COMMITTEE

ONTARIO FIELD BEAN COMMITTEE

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